

BULLETIN OF MISCELLANEOUS INFORMATION No. 4 1936 ROYAL BOTANIC GARDENS, KEW

XXV—MUNDULEA FISH POISON.

P. J. GREENWAY (Botanist, E.A.A.R.S., Amani, Tanganyika Territory).

Attention has recently been drawn by Worsley (1) to the insecticidal possibilities of *Mundulea sericea* (Willd.) Greenway, comb. nov. (*M. suberosa* (DC.) Benth.). The following is an account of its botany, ecology, distribution and recorded uses as a poison.

BOTANY.

The genus *Mundulea* was founded by Benthams (2 & 3), and it contains about 20 species (4) the majority of which are recorded from Madagascar. It was at one time included under *Tephrosia* and is a connecting link between that genus and *Millettia*.

Thonner (5) in his key description states that the seeds of some species are used as a fish poison but the only references of this nature I have been able to trace refer to *Mundulea sericea* (Willd.) Greenway, and not to any other species.

Mundulea sericea has been recorded from the Western Peninsula of India, Ceylon, Madagascar, Tropical Africa, and as far south as Natal and the Transvaal in South Africa. In Ceylon its distribution varies from rare to abundant, and it has been suggested that it may have been originally introduced into its few Ceylon localities (6, 7, 8, 9, & 10).

***Mundulea sericea* (Willd.) Greenway, comb. nov.** *Cytisus sericeus* Willd. Sp. Pl. 3. 1121 (1803). *Tephrosia sericea* DC. Prodr. 2, 249 (1825). *T. suberosa* DC. Prodr. 2, 249 (1825); Wight & Arn. Prodr. Fl. Ind. Or. 1, 210 (1834); Hook. Icones Pl. 2, t. 120 (1837); Wight, Ill. Ind. Bot. 1, 198, t. 79 (1840); Harv. in Harv. & Sond. Fl. Cap. 2, 204 (1862). *Robinia suberosa* Roxb. Hort. Beng. 56 (1814), nomen; Fl. Ind., ed. Carey, 3, 327 (1832). *R. sennoioides* Roxb. Fl. Ind., ed. Carey, 3, 328 (1832). *Dalbergia stricta* Bojer, Hort. Maur. 111 (1837), nomen. *Mundulea suberosa* Benth. Pl. Jungh. 248 (1852); Bak. in Oliv. Fl. Trop. Afr. 2, 126 (1871), and in Hook. f. Fl. Brit. Ind. 2, 110 (1876); Bak. f. Leg. Trop. Afr. 216 (1929). *Tephrosia ichthynece* Bertol. Misc. Bot. 18, 18. t. 3 (1858). *T. Petersiana* Klotzsch in Peters, Reise Mossamb. t. 9 (1861). *Mundulea striata* Baill. in Bull. Soc. Linn. Par. 1, 389 (1883).

An erect virgately branched shrub or a small slender tree up to

25 ft. tall, with smooth greenish yellow-brown bark or very rough longitudinally fissured very corky yellowish brown bark. Young branchlets densely pilose-velvety. *Leaves* alternate, numerous, imparipinnate; rhachis 3–17 cm. long, slightly to densely silky-pubescent; stipules small, linear; leaflets 9 to 19, the lower ones often alternate, shortly stalked, 1.5–7.3 cm. long, 0.8–2.4 cm. broad, narrowly ovate-lanceolate, obtuse, apiculate, more or less glabrous and bright green above, nearly glabrous to densely silky and silvery beneath. *Inflorescence* a rather dense terminal raceme. *Flowers* large on pilose pedicels 1–1.5 cm. long; calyx silky, deeply campanulate, segments short, broadly triangular, acute, the upper two connate; petals mauve or lilac, occasionally white, up to 2.5 cm. long; standard silky, broadly oval or obovate, with a long claw; wing-petals falcate, oblong, coherent with the keel near the base; keel obtuse, the apex incurved; upper stamen free and geniculate at the base, united upwards with the rest in a closed tube, filaments flattened upwards, anthers uniform; ovary multiovulate; style incurved, subterete, glabrous, the apex inflexed; stigma capitate. *Fruit* a pod 7.5–9.5 cm. long, 0.5–1 cm. broad, linear, flat, densely velvety with short golden brown hairs, sutures rather thick, subindehiscent; seeds 2–10, about 4 mm. broad, yellowish brown.

GEOGRAPHICAL RANGE AND HABITAT IN AFRICA.

Mundulea sericea is a shrub or small tree of light bushwoods and park steppes on dry slopes (4). It has been recorded from the Sudan to West Tropical Africa, Angola and S.W. Africa; and from Kenya southwards to Natal and the Transvaal. In Tanganyika Territory the Germans recorded it from the Usambaras, Bagamoyo, Usaramo, near Dar es Salaam, Uhehe and Bukoba (4).

Specimens of the plant are represented in the Amani Herbarium from the E. Usambaras, Kerenge, *Omari bin Chambo*. Umba Steppe, Mwakikonge, *Bally*. Kondoia-Irangi District, *Burt* 1026. Bukoba District, Nyaskozi, Karagwe, *Haarer* 2440. Mpwapwa District, near Tubugwe, *Hornby* 394. Iringa District, Iringa-Tukuyu Road, *Staples* 229. Cult. Amani, *Braun* 637, *Grote*. Kenya Colony, Samburu, *Graham* 1780. Zanzibar, *Mrs. Taylor* 70. Prison Island, *Wilson* H. 32/35.

In a recent attempt to discover more about its habitat and mode of occurrence a journey was undertaken along the western foot of the E. Usambaras as far north as Bwiti on the eastern side of the north end of the range on the borders of the Umba Steppe, an area in which it was reported to occur by some local natives.

It was found growing in open deciduous bush and open to closed evergreen bush formations at about 100 to 1500 ft. altitude. It formed small societies of fairly compact to rather scattered stands and was occasionally found singly on pale reddish brown to very dark red soils.



Digitized by the Internet Archive
in 2025



1. *Mundulea sericea* in deciduous bush formation subject to fire, showing habit and great development of coppice growth. N. end of E. Usambaras.



2. *Mundulea sericea*. A stand of dead and blackened sticks with young coppice shoots growing from base, in an area recently burnt S.W. of Daluni.

The deciduous bush formation varied from very open to more or less closed stands or even closed island-like stands in an open formation. It was chiefly composed of *Combretum* (tree and scandent species), *Dombeya*, *Lannea*, *Commiphora*, *Acacia*, *Lonchocarpus Bussei* Harms, *Stereospermum Kunthianum* Cham., *Grewia*, *Tamarindus indica* L. and *Terminalia spinosa* Engl. The most important grasses of the formation were *Chloris myriostachya* Hochst., *Panicum* sp., *Panicum maximum* Jacq. (in burnt areas) and *Themeda triandra* Forssk. together with *Cyperus compactus* Lam. The "island" stands were composed of a very dense block of vegetation of *Tamarindus indica* L., *Commiphora*, *Combretum* (scandent species) and *Entada phaseoloides* (L.) Merr. with an outer guard of *Sansevieria* surrounded by *Panicum* sp. and *Cyperus compactus* Lam.

In a secondary bush association a *Mundulea sericea* society was found growing with *Panicum maximum* Jacq., *Combretum* (bush species), *Markhamia obtusifolia* Sprague, *Dombeya*, *Indigofera*, *Solanum* and an occasional *Acacia*.

The formation is subject to periodical grass fires which control the habit of the *Mundulea*. The plant naturally develops a solitary stem which may attain a height of 25 ft.; but repeated grass fires kill the aerial parts and a great abundance of coppice growth develops at the base of the old stems. This may reach a height of 10 ft. to be again killed by fire; a stand is often seen of dead and blackened sticks with numerous young green coppice shoots up to 6 ft. tall growing from the bases of the old stems (Figs. 1 & 2).

The evergreen bush formation usually occurred on very bright red soils and in the majority of examples seen was always a closed formation. Its chief constituents were *Brachylaena Hutchinsii* Hutch., *Cynometra* sp., *Mimusops sulcata* Engl., *Euphorbia* spp. (*E. nyikae* Pax types frequent, dwarf succulent types and *E. Tirucalli* L. common, as well as candelabra types occasional), *Croton dichogamus* Pax, *Combretum* sp. (an evergreen liane), scandent shrubs of *Annonaceae*, scattered *Encephalartos Hildebrandtii* A. Br. & Bouché, tree and herbaceous *Aloë* spp., several species of *Sansevieria*, and a number of species of xerophytic epiphytic orchids. The scandent and beautiful white-flowered *Vanilla Roscheri* Rchb. f. hung its fleshy greenish brown stems like snakes over the bushes.

Mundulea sericea in this evergreen formation was of a different habit. It usually produced a solitary stem up to 25 ft. tall with a very lightly branched more or less flat crown occupying the second stratum in the 30 ft. and sometimes 40 ft. tall canopy. Its bark was greenish yellow and smooth, with almost imperceptible longitudinal fissures, strikingly different from the very corky bark produced by the plant in the Deciduous Bush Formation subject to fire.

I have examined thoroughly material from both formations. In each there is great variation in size and general outline of the

leaflets, but to my mind no satisfactory botanical distinctions can be made between the rough-bark and the smooth-bark types.

It is probable that the general habitat of the plant in India, Ceylon and Tropical Africa is a deciduous bush or scrub formation subject to grass and bush fires and that the corky bark is produced as an individual protection against fire. Where the plant is found in evergreen bush formations no corky bark is produced.

Mundulea sericea has also been recorded in *Brachystegia* woodland on sandy granitic soils (*Staples*, Iringa District) and as forming a local colony (*Hornby*, E. Mpwapwa). I have seen it in an evergreen bush formation east of Moa in the Umba Steppe and at Moa itself.

In Usambara *Mundulea* is nowhere frequent. It has everywhere to be searched for, but I have found it between 1000 and 1500 ft. as follows :-

- (a) In deciduous bush formation at Bombo, Maji Moto, Kwamticha, north end of E. Usambaras in the Umba Steppe, and south west of Daluni.
- (b) In a secondary bush association at Mashewa.
- (c) In evergreen bush formation at Kwemukumba near Kijango and near Hemagama on the Korogwe-Mashewa road.

Reports of its occurrence have been received from near Gomba between the Mkomazi and Pangani Rivers and from the Same district in the Middle Pares.

POISONOUS PROPERTIES.

Apparently the plant is well known to the natives of the Western Peninsula of India, Ceylon, Madagascar, and Tropical Africa as far south as Mozambique, as an extremely efficient fish poison.

The earliest published record of this use that I have been able to trace is that quoted by Greshoff (11) under the name *Tephrosia ichthyneca* Bertol., who quotes from D.A. Rosenthal, "Synopsis Plantarum Diaphoricarum" p. 1025 (1862). Greshoff further quotes: "Die Wurzel dieser auf Mozambique wachsenden Pflanze wird, vermuthlich aus Afrika, nach London als Fischgift importiert. Dragendorff vermochte das leicht zersetzliche wirksame Princip, das weder ein Glycosid noch ein Alkaloid zu sein scheint, nicht zu isoliren (Pharm. Zeit. 1881, p. 313.—Jahresb. für Pharm. 1881, 207) "

Other published African records appear to be few. It is not mentioned by Engler in 1895 (12) ; I have already referred to Thonner in 1915 (5) ; Harms in 1915 (4) simply states that the fruits are used as a fish poison. Irvine in 1930 (13) says : " This shrub is sometimes specially planted in towns as well as *Tephrosia Vogelii*, both shrubs being used as fish poisons ".

The earliest Indian record* appears to be one in 1886 (14), under the name *Mundulea suberosa*. " The seeds are used for poisoning fish ".

*J. Graham (Cat. Pl. Bombay, 47: 1839), under *Tephrosia suberosa* says : " The seeds are used to poison fish. "—Editor.

Further records from India are by Greshoff (11) who quotes an extract from *Pharmacographia Indica*, 1: 417 for the year 1889, "The seeds are used in Southern and Western India as a fish poison. They stupefy the fish which are then readily taken by the hand. The bark has the same effect upon fish as the seeds". Watt in 1891 (15) quotes the Indian name *Surti* and states that the seeds are used as a fish poison.

Collectors' field records on specimens preserved in herbaria in reference to its use as a fish poison are few.

In E. Africa *Mundulea sericea* is well known as *mkwaia* (Kiswahili) *kikoko* (Kishambala), *mundu* (Kinyaturu) and *mukati* (Kinyaturu). The Kiswahili "blanket" name *mtupa* or *utupa* for fish poisons in general is limited to *Mundulea* by the addition of *ya pori*.

All accounts that I have obtained from East African natives agree that the pounded bark is used to poison fish and not the seeds as reported in India. It may be mentioned in passing that most of the seed pods I have seen are infested with a boring insect and contain very few viable seeds.

Some native informants state that the corky bark is not as poisonous as the smooth, and accounts of its toxic action vary. They all agree that *Mundulea* is more poisonous than *Tephrosia Vogelii*. Some state that it will even kill crocodiles up to about 4 ft. long; others deny this but affirm that *Mundulea* has the effect of driving all crocodiles away from the river. In this connexion I was informed by an European Game Warden that all the crocodiles had been cleared from the Umba River by the Wakamba who employed a very effective poison, but I have not yet been able to connect this definitely with *Mundulea*.

I have been informed on good authority that cattle-owning peoples on the Pangani River tie strips of the bark round the legs of their cattle whenever they are taken to the river to water to protect them from crocodiles. This seems unnecessary if crocodiles can be driven away by merely throwing the pounded bark into the river.

Most natives are agreed that fish caught by the use of *Mundulea* bark are eaten with considerable risk of poisoning and that a number of such cases were known to them.

One native informant told me that the bark was also employed for homicidal purposes.

The method of collection adopted is to cut the stems at ground level and strip off the bark as far as the branchlets. If the sap is flowing freely the bark comes away quite easily and can be stripped off with the fingers; if not in active growing condition it has to be shaved off with a knife. The cutting of the stems at ground level does not kill the plant as it coppices freely.

With the assistance of the agricultural department of Tanganyika Territory we have arranged for the monthly collection of about one kilo of bark from certain areas at the western and northern foot of the E. Usambaras. The bulk of available material is not large and it is hoped that these areas will stand the monthly collection of bark for a year as it takes anything from one to seven bushes or small trees to obtain a kilo of fresh bark. In view of the commercial possibilities it may be stated that propagation from seed does not present any difficulties.

The chemistry of *Mundulea* is still imperfectly known and the monthly sampling of bark will enable Dr. Worsley, the Biochemist at Amani, to make systematic investigations. It has been reported that the bark and root contain a very toxic unnamed glucoside (11) but the preliminary work at Amani has not confirmed this. Dr. Worsley has, however, isolated rotenone from the bark and shown that there is great variation in both this and the insecticidal properties of the bark obtained from different localities, and that both vary in series of subsequent samples from the same locality.

REFERENCES.

1. WORSLEY, R. R. LE G. "The Insecticidal Properties of Some East African Plants: 3. *Mundulea suberosa* Benth. Pt.1. Insecticidal Properties". (Awaiting publication).
2. BENTHAM, G. in Miquel, *Plantae Junghunianae*, 248 (1852).
3. BENTHAM, G. in Benth. & Hooker, *Genera Plantarum*, 1, 497 (1865).
4. HARMS, H. in Engler, *Die Pflanzenwelt Afrikas*, 3, I, 592 (1915).
5. THONNER, F. *Flowering Plants of Africa*, 261 (1915).
6. BAKER, J. G. in Hooker, *Flora of British India*, 2, 110 (1876).
7. TRIMEN, H. *Handbook of the Flora of Ceylon*, 2, 29 (1894).
8. PALACKY, J. *Catalogus Plantarum Madagascariensium*, 4, 6 (1906).
9. BAKER, E. G. *The Leguminosae of Tropical Africa*, 216 (1929).
10. HARVEY, W. H. in Harvey & Sonder, *Flora Capensis*, 2, 204 (1861-62).
11. GRESHOFF, M. *Mededeelingen uit 'S Lands Plantentuin*, 10, 55-57 (1893).
12. ENGLER A. *Die Pflanzenwelt Ost-Afrikas und der Nachbargebiete*, 516-517 (1895). (Giftpflanzen: Zum Fischfang verwendete Giftpflanzen)
13. IRVINE, F. R. *Plants of the Gold Coast*, 295 (1930).
14. LISBOA, J. C. *The Gazetteer of the Bombay Presidency, Botany*, 25, 272 (1886).
15. WATT, G. *Dictionary of the Economic Products of India*, 5, 288 (1891).

XXVI—THE BAMBOO GENERA, *DINOCHLOA* AND *MELOCALAMUS*. F. A. McCLURE.

A careful study of authentic specimens of *Pseudostachyum compactiflorum* Kurz (the type of the monotypic genus, *Melocalamus* Benth) reveals the fact that this species is not generically distinct from *Dinochloa* Büse.* This rather surprising statement may be supported by the following summaries of the points of similarity and difference between the type species of the two genera.

GENERIC CHARACTERS IN COMMON.

1. Rhizome of a modified sympodial type (McClure, 1925)†.
2. Culms terete, zigzag (the nodes geniculate), more or less scandent, thick-walled, solid or fistulose, often with semi-dissociated strands of conducting tissue in the central canal.
3. Culm-sheaths glabrous, thickish, firm, with a peculiar expansible zone of variable width at the base, the auricles and oral setae prominently developed, the sheath-blade reflexed, finely striate, glabrous, or nearly so, except near the base on the upper surface.
4. Branches in abruptly spreading tufts, slender, terete, short, subequal, with one strong, central one, which sometimes does not develop beyond the bud stage.
5. Leaf-blades glabrous throughout, the venation obscurely pseudotessellate.
6. Inflorescences spicate, consisting of dense clusters of minute pseudospikelets at the nodes of slender branches with short internodes.
7. Spikelets 1-flowered, terminal on dwarf branches of the rachis (axes of pseudospikelets).
8. Glumes (empty) usually 2, obtuse, ventricose, glabrous, similar to the lemma, but smaller, and preceded by one or more, still more minute, gemmiferous bracts, and by a tiny prophyllum.
9. Lemma rotund, or ovoid, ventricose, more or less distinctly keeled, glabrous.
10. Palea oblong, ventricose, not keeled, or only very obscurely so near the base.
11. Stamens 6, not exserted, the filaments very short, free, the anthers usually more or less apiculate.
12. Ovary narrow, glabrous, the style very short, the stigmas 3 or 2, relatively short and thick.
13. Fruit a dry berry or nut, with a thick, tough pericarp, globular, with three scales (the upper glume, the lemma, and palea) persistent at the base.

* The type of Büse's genus is at the Rijksherbarium in Leiden, where I examined it by the kind permission of Dr. Lam, the Director, and Dr. Henrard, the Conservator of the Herbarium. A detailed redescription of the type species of this genus, with an account of the synonymy and of some of the circumstances surrounding its valid specific name is under preparation.

† For references see end of paper.

THE TWO SPECIES CONTRASTED.

	<i>Dinochloa</i> <i>scandens</i> (Bl.) O.Ktze.	<i>Pseudostachyum</i> <i>compactiflorum</i> Kurz.
1. The expan- sible zone at the base of the culm- sheath.	More prominent.	Less prominent.
2. Flowering branches	Glabrous, producing short, secondary and tertiary branches.	Retorse - pubescent; primary branches only, secondary ones very rarely, the tertiary not at all developed, in specimens seen.
3. Glumes.	Scarcely keeled.	Distinctly keeled.
4. Lemma.	Distinctly smaller than the palea, more or less noticeably com- pressed, the central nerve not prominent.	Equal to, or slightly larger than, the palea, the central nerve prom- inent.
5. Palea.	Glabrous, papery to firm in texture, the nerves very obscure, sometimes with the re- motest suggestion of a 2-keeled condition at the very base; the margins membranace- ous, much convolute, not visibly ciliate at the apex.	Glabrous or nearly so, very thin, membranace- ous, two more or less visibly keel-like nerves in the lower part at the back; the margins not convolute, prom- inently ciliate at the apex.
6. Lodicules.	None or only rudimen- tary.	Three, conspicuous.
7. Anther - tips (extension of connectives).	Long, prominent, scab- rous to penicillate.	Short, inconspicuous, glabrous.
8. Fruit.	At maturity rarely ex- ceeding 1 cm. in dia- meter.	Up to 3 cm. in diameter

When compared in number and importance, with the *differences* between the two species, the *resemblances* are seen to be greater by far, and quite ample to justify their inclusion in the same genus. We have, therefore, to make the following new combination: ***Dinochloa compactiflora* (Kurz) McClure**, comb. nov.

Pseudostachyum compactiflorum Kurz, in Journ. As. Soc. Bengal, **42**, 252 (1873); Indian For. **1**, 361. pl.2, fig. 13 (1876); For. Flor. Brit. Burma, **2**, 567 (1877).

Melocalamus compactiflorus Benth. in Journ. Linn. Soc., Bot. **19**, 134 (1881) (without generic descr.); in Benth. et Hook. f. Gen. Pl. **3**, 1212 (1883) (with generic descr.).

Bentham cited no specimens. However, there are, in the Herbarium of the Royal Botanic Gardens, Kew, several sheets of flowering and fruiting specimens of this bamboo, which were collected by Kurz in the type locality (Martaban, British Burma), identified by him, and labelled, in his handwriting, *Pseudostachyum compactiflorum* Kurz. From these authentically named specimens we may form a clear idea of the branching habit, and of the character of the inflorescences and fruits, as well as the culm-sheaths, which are so often lacking in flowering specimens of bamboos. By means of these latter, which are very characteristic, we may associate with the leafless, flowering specimens, sterile specimens which afford fully developed foliage.

In order to forestall any misunderstanding which might grow out of the fact that my statements, in tabular form above, appear to be irreconcilable, in certain respects, with the original descriptions of the species in question, I will remind the reader that in my terminology and in my interpretation of bamboo morphology, particularly that of the inflorescence, I differ on many points from those who have prepared descriptions of bamboo genera and species in the traditional manner. †

The basic structure of the inflorescence in *Dinochloa*, as in *Schizostachyum*, is one which I have termed the *pseudospikelet*, because it has so often been mistaken for a *spikelet*. As I have already pointed out elsewhere (McClure, 1934), the pseudospikelets have as their axes dwarf branches of the rachis. These are clothed at the base with one or more gemmiferous bracts, preceded by a prophyllum and followed by glumes (where these are present) and then the florets. The buds in the axils of the bracts are potential pseudospikelets. Among the numerous dire results of the misinterpretation of these structures I may point out several which may be responsible for obscuring the real taxonomic position of *Melocalamus* for so many years.

The buds in the axils of the bracts at the base of the pseudospikelets have been mistaken for rudimentary florets, and their

† My observations of the minute details were made by means of a binocular microscope, using 10x eyepieces with .7x and 2x objectives.

prophylls, naturally, for paleas. As a result, the "spikelets" (the pseudospikelets in my sense) have been spoken of as several-flowered when, in reality, the *true* spikelets are one-flowered. Furthermore, the significance, for taxonomic purposes, of the prophylls, the gemmiferous bracts, the true (empty) glumes, as well as the lemmas, has not been utilized to its best advantage, since these structures have been confused, both in terminology and interpretation.

To document these statements, I need only to refer to the original descriptions of the two species and the two genera under discussion in this paper (Schultes, 1830; Büse, 1854, pp. 387-388; Kurz 1873 and 1877; Bentham, 1881 and 1883) and to the interpretation of *Dinochloa* Büse in Munro's description (Munro; 1868, p. 153) and the illustration of the "spikelets" (really pseudospikelets) (ibid., figs. 2 and 3 of plate 5) and of the "two-keeled paleas" (really prophylls of the buds in the axes of the bracts of the pseudospikelets) (ibid., figs. 4 and 5, plate 5).

In closing I wish to acknowledge my great indebtedness to the Director, and to the Keeper of the Herbarium, of the Royal Botanic Gardens, Kew, for the privilege of making extensive studies of the Oriental bamboo types at Kew, and for many courtesies conferred upon me by their staff in this connection. I owe special thanks to Mr. C. E. Hubbard for numerous kindnesses he bestowed upon me during my sojourn at Kew.*

REFERENCES.

1. BENTHAM, G. *Journ. Linn. Soc., Bot.* **19**, 134 (1881).
2. BENTHAM, G. in Bentham & Hooker, *Gen. Pl.* **3**, 1212 (1883).
3. BÜSE, L. H. "Gramineae" in Miquel, *Plantae Jungh.* (1854).
4. CAMUS, E. G. *Les Bambuseés*. Texte (1913).
5. GAMBLE, J. S. *Ann. Bot. Gard. Calcutta*, **7**, (1896).
6. GAMBLE, J. S. in Hooker, *Flora Brit. India* **7**, (1896).
7. HACKEL, E. "Gramineae" in Engler & Prantl, *Naturl. Pflanzenfam.* **2**, (2), 89-97 (1887).
8. HUBBARD, C. E. "Gramineae" in Hutchinson, *Families of Flowering Plants*, **2**, 203-205 (1934).
9. KURZ, S. *Journ. As. Soc. Bengal*, **42**, 252 (1873).
10. KURZ, S. *Ind. For.* **1**, 361, fig. 13, pl. 2 (1876).
11. KURZ, S. *For. Flora Brit. Burma*, **2**, 567 (1877).
12. McCLURE, F. A. *Lingnam Agr. Rev.* **3**, 40-47, figs. 1-9 (1925).
13. McCLURE, F. A. *Journ. Washington Acad.* **24**, 541-548 (1934).
14. MUNRO, WM. *Trans. Linn. Soc., Bot.* **26** (1868).
15. SCHULTES, J. A. & SCHULTES J. H. in Roem. & Schult. *Syst. Veg.* **7**, 1358 (1830).

* Acknowledgment is also made of my indebtedness to the Rockefeller Foundation, of New York, for financial aid making possible the purchase of literature and equipment essential to the continued pursuit of these studies. And finally, it is a pleasure to acknowledge my deep obligation to the late Dr. A. S. Hitchcock and to Mrs. Agnes Chase, Agrostologists of the U. S. National Herbarium, for the facilities, the advice and the encouragement that they lent me constantly during my sojourn in Washington.

XXVII—ERANTHEMUM OF THE "FLORA OF TROPICAL AFRICA." E. MILNE-REDHEAD.

C. B. Clarke, when writing the account of the *Acanthaceae* for the "Flora of Tropical Africa," appears to have overlooked the conclusions at which Radlkofer had arrived several years previously. Radlkofer* had pointed out that the genus *Eranthemum* as defined by Linnaeus, was synonymous with *Daedalacanthus* T. Anders., a member of the tribe *Ruellieae*, and that most of the species hitherto placed in *Eranthemum* must be transferred to a new genus which he called *Pseuderanthemum*, and which belonged to the tribe *Justicieae*†. C. B. Clarke, however, retains in the genus *Eranthemum* ten species which, in the opinions both of Radlkofer and of Lindau, should have been placed in the genus *Pseuderanthemum* Radlk., *Eranthemum* L. not being known from the African continent, unless one considers it to be synonymous with *Lankesteria* Lindl., a view not held by the writer.

Thus the genus *Pseuderanthemum* Radlk. was created to include the species which T. Anderson had erroneously placed in *Eranthemum*. In his definition of this genus Anderson states "antheris bilocularibus, loculis plus minus divaricatis muticis." Whilst several of the species enumerated by Clarke in the "Flora of Tropical Africa" agree with Anderson's description of *Eranthemum* in having ditheous anthers and can be retained in *Pseuderanthemum*, others have anthers which are monothecous, and must accordingly be placed in *Ruspolia* Lindau, a hitherto monotypic genus created for a plant collected by Dr. Riva in southern Abyssinia. *Pseuderanthemum* and *Ruspolia* are undoubtedly very closely allied, but it is convenient to treat them as distinct genera and in doing so the writer is following both Clarke and Lindau.

It is remarkable that the presence of monothecous anthers in certain species of "*Eranthemum*" had not attracted the attention of workers on the African *Acanthaceae*. As early as 1827, Schumacher and Thonning‡ in an excellent description of *Justicia hypocrateriformis* Vahl, mentioned that the anthers are unilocular, and in the figures both of *Eranthemum hypocrateriformis* and *Pseuderanthemum seticalyx* in the "Botanical Magazine" (tt. 6181, 8244), the anthers are shown quite correctly as being monothecous, but in neither case are they so described in the text. On the other hand, a curious error is the drawing by Clarke of a ditheous anther on a sheet of *Eranthemum hypocrateriformis* in the Kew Herbarium.

Whilst *Pseuderanthemum* is widely distributed in the tropics of both the Old and the New World, *Ruspolia* appears to be confined to the African continent. Both *Pseuderanthemum* and *Ruspolia* are

* Sitzb. Math.-phys. Cl. Akad. Wiss. Muench. **13**, 282 (1883).

† see Stapf. in Bot. Mag. **135**, sub.t. 8239 (1909).

‡ Beskr. Guin. Pl. 12 (1827).

widely spread in tropical Africa, but do not occur in Africa outside the tropics, although one species of *Ruspolia* reaches the northern Transvaal. In Africa it appears that *Pseuderanthemum* is usually associated with moist and shady habitats, several of the species being plants of the closed forest, whilst others, which grow in areas of lower rainfall, are constantly found in the evergreen fringing-forests along rivers. On the other hand *Ruspolia* does not occur in the closed forest, and frequently grows in dry and rocky country.



Fig. 1 Distribution of *Pseuderanthemum Ludovicianum* and *P. campylosiphon*.

Associated with this difference in the habitat requirements of *Pseuderanthemum* and *Ruspolia* is the colour of the flowers. The species of *Pseuderanthemum* inhabiting the closed forest have flowers which are whitish, flecked or flushed with lilac or mauve. Only two species have flowers which are bright red, *P. dispersum* and *P. Hildebrandtii*. Whilst little is known as to the habitat of the former species, the latter is a plant of fringing forests and evergreen thickets in East Africa, and, though flourishing in these moist and shady conditions, it appears able to survive lighter and drier periods, during the rainless seasons. In *Ruspolia*, plants of open sunny habitats, the flowers are all bright shades of red.

The form of the seeds of *Pseuderanthemum* and *Ruspolia* not only affords reliable specific characters, but also confirms the separation of *Ruspolia* as a genus distinct from *Pseuderanthemum*. In general the seeds of *Pseuderanthemum* are without any definite horny rim, and are rough on both faces, although the degree of roughness is usually greater on the inner surface. Those of *Ruspolia* are considerably larger, having a definite horny margin, are always smooth on their outer surface, and may or may not have a bold pattern on their inner surface. There is one exception to this rule, *P. Hilde-*



Fig. 2. Distribution of *Pseuderanthemum Hildebrandtii*, *P. Lindavianum*, *P. dispersum* and *P. subviscosum*.

brandtii, whose seeds are often smooth on their outer surface, and whose markings form a much more definite pattern than is the case in the seeds of the other African *Pseuderanthema*. The seeds of the recently described *P. campylosiphon* Mildbr. are as yet unknown, and unripe seeds of *P. subviscosum* appear similar to those of *P. Ludovicianum*. As the character of the seeds is extensively used in the accompanying keys, a series of illustrations has been prepared showing the seeds of the majority of the species. It should be pointed out that the seeds of *P. tunicatum* are in reality more similar to those of *P. Ludovicianum* than is suggested by the illustration. The seed of *P. Ludovicianum* which is figured, is unfortunately not completely mature, and immature seeds of *P. tunicatum* show a similar patterned roughness which becomes obscure as the seed ripens.

The distribution of the species of both genera is similar in that certain species are widely spread and others are extremely local. In the accompanying maps, which illustrate this fact in a striking manner, occurrences are plotted as accurately as possible whenever the locality is sufficiently indicated. Much field and taxonomic work yet requires to be done before it is possible to prepare maps of Tropical African species which will show in detail their complete distributions. Our knowledge of the flora is, however, sufficiently advanced for a start to be made to study the distribution of species within the continent, and to produce a classification of the various types of distribution which occur. It is unnecessary to emphasize the unsatisfactory distinction made between Eastern and Western species, which has in the past led to the creation of many new species, which now so often merely serve to swell the ever-growing lists of synonymy.

Of the ten species of *Eranthemum* enumerated by Clarke in the "Flora of Tropical Africa," four are now transferred to *Ruspolia*, one of them being reduced. The remaining six species are placed in *Pseuderanthemum*, two of them being reduced to synonymy. *P. Lindavianum* De Wild. and Th. Dur. which in the addenda to the Flora is wrongly reduced to *Rhinacanthus nasutus* (L.) Kurz (*R. communis* Nees), is now retained as a distinct species. Of the two species described since the publication of the "Flora of Tropical Africa," *Eranthemum bilabiale* C.B.Cl. is treated as synonymous with *Pseuderanthemum Ludovicianum* (Büttner) Lindau, and *P. campylosiphon* Mildbr. is retained as a distinct species. One new species of *Pseuderanthemum* and one new variety of *Ruspolia* are described in this paper.

The writer wishes to express his gratitude to the Keeper of Botany at the British Museum (Natural History) for allowing him to examine material in the herbarium. He also wishes to thank the Director of the Botanic Garden at Berlin, the Director of the Botanic Garden at Brussels, and Mr. P. J. Greenway of the East African

258

Research Station, Amani, for kindly lending specimens for examination. For the preparation of the illustrations accompanying this, paper, the writer is indebted to his wife and to Miss S. Ross-Craig.



Fig. 3. Distribution of *Pseuderanthemum tunicatum*.

KEY TO THE AFRICAN SPECIES OF PSEUDERANTHEMUM RADLK.

Corolla-tube less than 1 cm. long, strongly curved ; flowers white ; capsule and seeds unknown.....1. *campylosiphon*

Corolla-tube more than 1 cm. long, or if less than 1 cm. long, not strongly curved.

Capsule normally 4-seeded.

Flowers light salmon-pink to brick red ; seeds smooth on outer, strongly reticulate on inner surface.....2. *Hildebrandtii*

Flowers white, flushed or spotted with pink, mauve or blue, never uniformly bright red ; seeds rough on both surfaces, not strongly reticulate on inner surface.

Capsule pubescent and glandular outside ; corolla-tube strongly inflated above ; stamens included ; flowers dull pink with darker centre ; seeds minutely rugose and pubescent.....3. *Lindavianum*

Capsule glabrous outside.

Corolla distinctly bilabiate ; stamens exserted.

Corolla-tube somewhat inflated above ; capsule less than 3 cm. long ; nodes of inflorescence few-flowered 4. *subviscosum*

Corolla-tube scarcely inflated above ; capsule often more than 3 cm. long ; nodes of the inflorescence many-flowered..... 5. *Ludovicianum*

Corolla not distinctly bilabiate; stamens included; inflorescence rather slender with few flowers at each node; corolla somewhat inflated above; capsule less than 3 cm. long..... 6. *tunicatum*

Capsule normally 2-seeded, slightly pubescent outside; flowers brick red to scarlet, with a darker centre; inflorescence finely glandular; seeds finely muricate, especially on the inner face..... 7. *dispermum*

ENUMERATION OF THE AFRICAN SPECIES OF PSEUDERANTHEMUM RADLK.

1. *P. campylosiphon* Mildbr. in Notizbl. Bot. Gart. Berl. **11**, 1084 (1934).

TANGANYIKA TERRITORY. Morogoro District, in secondary forest, Uluguru Mts., 1500 m., *Schlieben* 2810 (type); Morogoro District, 1350 m., *Wallace* 143, 460; without locality, 1500 m., *Kirk* s.n.

This very distinct species had remained obscure until last year (1934) when Mildbraed described it from flowering material collected by Schlieben. About the same time specimens, also in flower, were received at Kew from Wallace. These were identified with an unnamed specimen sent to Kew by Sir John Kirk in 1882. *P. campylosiphon* is easily distinguished from all other African *Pseuderanthema* by its small flowers with short curved corolla-tube. Its fruits are not yet known.

2. *P. Hildebrandtii* Lindau in Engl. Bot. Jahrb. **20**, 39 (1894); Engl. Pflanzenw. Ost-Afr. C. 371 (1895); Lindau in Engl. and Prantl, Pflanzenfam. **4**, 3B. 330 (1895). *Eranthemum Hildebrandtii* C.B.Cl. in Dyer, Fl. Trop. Afr. **5**, 172 (1899).

KENYA COLONY. Kibwezi, 1000 m., *Scheffler* 81, *Kaessner* 701, *Dummer* 5070; Tana River at Embere near Embu, 660 m., *M. D. Graham in Kenya Agric. Herb.* 1706; Tana River, 480 m., *Battiscombe in Kenya For. Herb.* 254; Mida, R. N. *Graham in Kenya For. Herb.* 1965; Lamu to Witu, *Whyte* s.n.; the Coast, without locality, *Gardner in Kenya For. Herb.* 1451; Nyika Country near Mombasa, *Wakefield* s.n.; Rabai Hills, Mombasa, *Taylor* s.n.; Mwachi Creek, Mombasa, *Priestley & Scott* s.n.; Shimoni, *Whyte*, s.n.

TANGANYIKA TERRITORY. Rau Forest, Moshi, 780 m., *Haarer* 725; Rau and Kahe Forests, 1050 m., *Lewis* 80; Mwembe, Pare, 900-1350 m., *Greenway* 2055; Duga, Usambara, *Holst* 3159; Maschana, Usambara, *Holst* 8800; Longuza, E. Usambara, *Zimmermann in Herb. Amani* 6315; Mombo, *Braun in Herb. Amani* 1788; Tanga, *Holst* 2110; Magila, near Tanga, *Kirk* s.n.; Zindeni Hills near Handeni, 600 m., *Burt* 4858; Mt. Msassa, *Volkens* 64; Kilosa, 490 m., *Burt* 126, *Swynnerton* 745; Morogoro, 600 m., *Schlieben* 3317; Kimbosa and Morogoro, 200-360 m., *Bruce* 1042; Rufigi, 15 m., *Musk* 34.



Fig. 4. Distribution of *Ruspolia decurrens*, *R. hypocrateriformis* and *R. hypocrateriformis* var. *australis*.

ZANZIBAR PROTECTORATE. Zanzibar, Kirk s.n., Hildebrandt 981 (type); Last s.n., Toms 90; Taylor 160, 538; J. H. Vaughan 1077.

A very distinct species, always recognizable at once by its seeds. Under dry conditions it is densely branched and has short internodes and small leaves, whilst under favourable conditions it develops a lax habit with large leaves. The flowers are various shades of light red.

3. *P. Lindavianum* De Wild. & Th. Dur. in Compt.-rend. Soc. Bot. Belg. **38**, 104 (1900); C. B. Clarke in Dyer, Fl. Trop. Afr. **5**, 514 (1900); De Wild. & Th. Dur. Contr. Fl. Cong. **2**, 49 (1900) et Reliq. Dewèvre. 180 (1901); Th. & Hel. Dur. Syll. Fl. Cong. 428 (1909); De Wild. Étud. Fl. Bas- et Moyen-Cong. **3**, 272 (1910). *Rhinacanthus communis* C. B. Cl. in Dyer, Fl. Trop. Afr. **5**, 514 (1900), p. p. non Nees.

BELGIAN CONGO, Chimbete. Dewèvre 317 (type); Bas-Congo, without locality, Cabra-Michel 21; Banana, Verschueren 441; Moanda, Gillet 3234, Vanderyst s.n.; Kizu, Wellens 277; Luki, Brixhy s.n.

Plants of this species were found to be in cultivation at Kew under the name *Eranthemum nigritianum* T. Anders., a species from which it is easily separable on account of its pubescent capsule and its seeds. The history of the cultivated plants could not at first be traced, and the species was, at the time, unrepresented in the Kew Herbarium. Light has since been thrown on the matter by the discovery in the Herbarium store of an unmounted specimen taken from a plant which was growing in the Gardens in 1917 that had been raised from seed sent by Mr. Gossweiler in 1915, probably from the



S.R.C.

Fig. 5. *Pseuderanthemum Lindavianum*. De Wild. & Th. Dur. 1, part of inflorescence, *nat. size*; 2, part of a lower leaf, $\times \frac{2}{3}$; 3, calyx, $\times 4$; 4, corolla, in section, $\times 2$; 5, stamen & staminode, front view, $\times 8$; 6, stamen, side view, $\times 8$; 7, pollen grain, $\times 300$ (approx.); 8, ovary & disc, $\times 12$; 9, stigma, $\times 16$; 10, part of infructescence, *nat. size*; 11, capsule valves, $\times 2$; 12, seed, $\times 6$.

Portuguese Congo. The accompanying plate (fig. 5) was prepared from the living material and corresponding specimens are now preserved in the Herbarium. Like *P. dispernum*, *P. Lindavianum* appears to have a very restricted distribution, being known only from a small area around the mouth of the River Congo.

4. *P. subviscosum* (C. B. Cl.) Stapf in Bot. Mag. **135**, sub. t. 8244 (1909) ; Lindau in Wiss. Ergebn. Deutsch. Zentral-Afr.-Exped. 1907-8, **2**, 301 (1911). *Eranthemum subviscosum* C. B. Cl. in Dyer, Fl. Trop. Afr. **5**, 173 (1899) ; S. Moore in Journ. Linn. Soc. Bot. **40**, 161 (1911) ; Eyles in Trans. Roy. Soc. S. Afr. **5**, 483 (1916).

PORTUGUESE EAST AFRICA. Makua, Namuli Hills, *Last* s.n. (type)

NYASALAND. R. Shire, Shibisa [Chikwawa]—Tshinmuze, 600–1200 m., *Kirk* s.n. ; Mt. Chiradzulu, 60–300 m., *Meller* s.n. ; Mt. Milanji, 1200 m., *McClounie* 60, *Shinn* s.n. ; without locality *Buchanan* 118, 449, 558.

SOUTHERN RHODESIA. Umtali, 1500–1800 m., *Steedman in Herb. Eyles* 5146 ; Melsetter District, Chirinda Forest, 1100–1200 m., *Swynnerton* 130.

This species is very closely allied to *P. Ludovicianum* and *P. tunicatum*, and in some respects combines the characters of these two species. It is confined to the highlands of south-eastern tropical Africa. Ripe seeds of *P. subviscosum* are still unknown.

5. *P. Ludovicianum* (Bütttn.) Lindau in Engl. & Prantl, Pflanzenfam. **4**, 3B. 330 (1895) ; Th. Dur. & Schinz, Etud. Fl. Cong. **220** (1896) ; De Wild. & Th. Dur. Ill. Fl. Cong. **63**, t. 32 (1899) ; Contr. Fl. Cong. **2**, 48 (1900) ; Pl. Thonn. **1**, 41 (1900) ; Lindau in Schlecht. Westafr. Kautschuk-Exped. 316 (1900) ; De Wild. Étud. Fl. Bas- et Moyen-Cong. **2**, 203 (1907) ; **3**, 273 (1910) ; Th. & Hel. Dur. Syll. Fl. Cong. 428 (1909) ; De Wild. Pl. Thonn. **2**, 385 (1911) ; Étud. Fl. Kat. **2**, 148 (1913) ; De Wild. in Bull. Jard. Bot. Brux. **7**, 81 (1920) ; Contr. Fl. Kat. 202 (1921) ; Pl. Beq. **4**, 30 (1926). *Eranthemum Ludovicianum* Bütttn. in Verh. Bot. Ver. Brand. **32**, 41 (1890) ; C. B. Cl. in Dyer, Fl. Trop. Afr. **5**, 172 (1899) ; S. Moore in Cat. Pl. Talb. Nigeria, 140 (1913) ; Hutch. & Dalz. Fl. W. Trop. Afr. **2**, 262 (1930). *Eranthemum ardisioides* C. B. Cl. in Dyer Fl. Trop. Afr. **5**, 173 (1899). *Eranthemum bilabiale* C. B. Cl. in Bull. Misc. Inform. Kew, 1906. 252 (1906).

NIGERIA. Oban District, *Talbot* 379, 1390, 1398, 1423, 1437.

BRITISH CAMEROONS. Victoria, *Preuss* 598 ; Johann-Albrechtshöhe, *Staudt* 537 ; Muea, 800 m., *Schlechter* 12853 ; above Buea, *Dalziel* 8210 ; Buea 900 m., *Maitland* 196.

FERNANDO PO. *Mann* 1437.

CAMEROONS. Between Ngusi and Mafura, 400 m., *Schlechter* 12905.

BELGIAN CONGO. Yanga, *Jespersen* 12; without locality, *Jespersen* 159; R. Ganga near Kasongo, *Büttner* 460 (type); Kasongo, *Vanderyst* 17483, 17557; Kenge, *Huyghe* s.n.; Kutu, *De Giorgi* 1278; Lac Tumba, *Laurent* s.n.; Bikolo, *Goossens* 2317; Eala, *Schouteden* 184, *Laurent* 1121, *Pynaert* 856, 901, 1045, *Corbisier* 947; Boende, *Goossens* 2603; Waka, *Goossens* 2704; Monsole, Ruki Valley, *Goossens* 2717; Lulanga, s.n. 145; Basankusu, *Bruneel* s.n.; Bolombo, *Thonner* 97; Mobeka, *De Giorgi* 35; Budjala, *Goossens* 4300; Gerena, *Goossens* 4316; Libanza *Goossens* 4761; Karawa, *Goossens* 4775, 4776, 4805, 4825; between Karawa and Likimi, *Goossens* 6316; Likimi *De Giorgi* 88; Lisala *Goossens* 4138; Don-dussane, *Reygaert* 32, *Morethan* 619; Yambata, *Vermoesen* 40, *De Giorgi* 1358, 1620; Bumba, *Linder* 1848; Mobwasa, *Lemaire* 270, 399, *Reygaert* 786, 826, 926, 947, 1185, 1257, 1261, 1341, *De Giorgi* 673, 845; Imese, *Laurent* s.n.; Barumbu, *Laurent*, 1027, *Bequaert* 1025; Basoko, *Dewèvre* 426; Bomane, *Laurent* 1435; Mogandjo, *Laurent* 1404, 1411; R. Lomani, *Descampes* s.n.; between Buta and Mbina, *Seret* 98; Nala, *Boone* 155; Stanleyville, *Ghesquiere* 20, *Duchesne* 15, *Claessens* 621; Penghe, *Bequaert* 2403, *Putnam* 54, 94; between the Lubile and the Lukaya, *Vandermeiren* s.n.; Grelco Section, *Quarré* 2592; indecipherable locality, *Vanderyst* 22107, 22164, 22189; Mossote, *Ledoux & Huyghe* 13; Djombo, *Collaer* 11; without locality, *Dewèvre* 782, 1147; Lolungu, *Vanderyst* 145.

UGANDA. Bwamba Forest, Toro, *Hazel* 174; Bwamba Pass, Ruwenzori, 1600 m., *G. Taylor* 3276; crater lake, Toro, *Tufnell* s.n.; Mpanga Forest, Toro, 1800 m., *G. Taylor* 3210; Budongo, Bunyoro, *Brasnett*, in *Uganda For. Herb.* 241; Bunyoro, *Evans* 742; Ngusi River, Lake Albert, 900 m., *Bagshawe* 1359; Ankole, *Fyffe* 62/15, 70/15; Namalala Forest, *Fyffe* 124; Semunye Forest, *Fyffe* 224; Bweya Forest, *Fyffe* 211; Bukasa, Sese Islands, *Thomas* 874; Mawokoto, *Brown* 209; Entebbe, *Mahon* s.n., *Fyffe* 198, *Maitland* 566, *E. & C. Godman* 33; Kitibulu Forest, *G. Taylor* 3378; Mukono, Kyagwe, 1200 m., *Hansford* in *Herb. Snowden* 1880; Mukono and Kirerena, Kyagwe, *Dummer* 248; Sezibwa Fall, *Jack* in *Coryndon Mus. Herb.* 5878; Buvuma Is., *Bagshawe* 632; Bumoni, Elgon, 1800 m., *Snowden* 864; without locality, *Scott-Elliot* 7521. (type of *Eranthemum ardisioides* C.B.Cl.7).

KENYA COLONY. North Kavirondo, 1500 m., *Jack* 149; Kakumega Forest, *Battiscombe* in *Kenya For. Herb.* 1210.

This species is confined to the evergreen forests, its distribution stretching from Nigeria through the Cameroons and the Congo to the Nyanza basin.

6. *P. tunicatum* (Afzel.) Milne-Redhead, comb. nov. *Justicia tunicata* Afzel. Remed. Guin. **3**, 17 (1814); Roem. and Schultes Syst. **1**, 581 (1817); Spreng, Syst. **1**, 79 (1825); A. Dietr. Sp. Pl. **1**, 378 (1831); Nees in DC. Prodr. **11**, 428 (1847). *Eranthemum nigritianum* T. Anders. in Journ. Linn. Soc. Bot. **7**, 51 (1863); S. Moore in Journ.

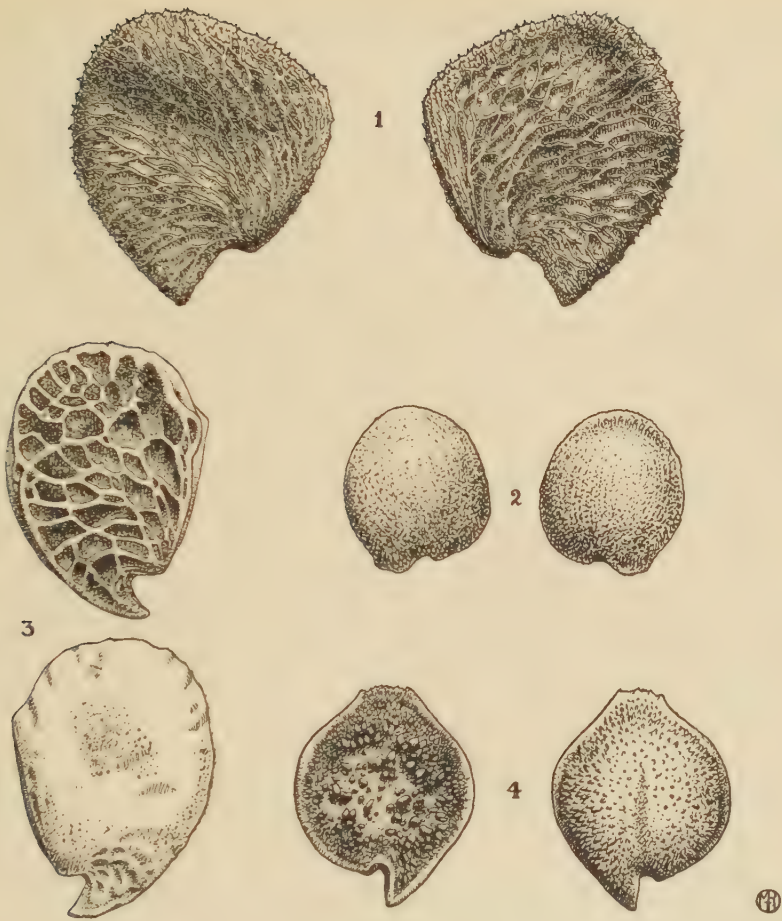


Fig. 6. Seeds of species of *Pseuderanthemum* Radlk. (all $\times 6$). 1, *P. Ludovicianum* (Büttner) Lindau; 2, *P. tunicatum* (Afzel.) Milne-Redhead; 3, *P. Hildebrandtii* Lindau; 4, *P. dispernum* Milne-Redhead.

Bot. **18**, 308 (1880) ; C. B. Cl. in Dyer, Fl. Trop. Afr. **5**, 171 (1899) ; S. Moore in Cat. Pl. Talb. Nigeria, 140 (1913) ; De Wild. in Bull. Jard. Bot. Brux. **7**, 75 (1920) ; Hutch. & Dalz. Fl. W. Trop. Afr. **2**, 262 (1930) ; Irvine, Pl. Gold Coast, 183 (1930). *Pseuderanthemum nigrisianum* Radlk. in Sitzb. Math.-phys. Cl. Akad. Wiss. Muench. **13**, 286 (1883) ; Lindau in Engl. & Prantl, Pflanzenfam. **4**, 3B. 330 (1895) ; Th. Dur. & De Wild. Mat. Fl. Cong. **1**, 37 (1897) ; De Wild. & Th. Dur. Contr. Fl. Cong. **1**, 46 (1899) ; Hiern. in Cat. Welw. Afr. Pl. **1**, 818 (1900) ; De Wild. Étud. Fl. Bas- et Moyen-Cong. **1**, 320 (1906), **3**, 273 (1910), **3**, 481 (1912) ; S. Moore in Journ. Bot. **45**, 92 (1907) ; Th. & Hel. Dur. Syll. Fl. Cong. 429 (1909) ; De Wild. Pl. Thonn. **2**, 385 (1911) ; Étud. Fl. Kat. **2**, 148 (1913) ; Contr. Fl. Kat. 203 (1921) ; Pl. Bequaert. **4**, 30 (1926) ; S. Moore in Journ. Bot. **68**,

Suppl. 2, 136 (1930). *Eranthemum Lindau* C. B. Cl. in Dyer, Fl. Trop. Afr. 5, 173 (1899).

SIERRA LEONE. Freetown, *Dalziel* 948; Njala, *Deighton* 1079, 1756; Port Loko, *Glanville* 260; without locality, *Ardinus* s.n. (type), *Thomas* 7943, 10082, 10517; Kukuna, *Scott-Eliot* 4692; Bowya, *Bunting* 17.

GOLD COAST. Assin Yan to Kumasi, *Cummins* 237; Banka, *Irvine* 492; Abetifi, Kwahu, *Irvine* 1665; Sunyani, *Chipp* 74; Nkwanta, *Chipp* 64; Kaforidua Hills, *Johnson* 440; without locality, *Farrar* 518; Moor B30.

TOGO. Without locality, *Baumann* 375.

NIGERIA. Lagos, *Barter* 3300 (type of *Eranthemum nigrithanum* T. Anders.); Oban District, *Talbot* 1356, 1392, 1435, 1436, 1448, 1538, 1578; without locality, *Thomas* 2309; *Rosevear* 10 30; *Kennedy* 2186, 2092; *MacGregor* 504.

BRITISH CAMEROONS. Victoria, *Preuss* 1108; without locality, *Preuss* 1366; Johann-Albrechtshöhe, *Staudt* 561.

FERNANDO PO. *Mann* 156.

CAMEROONS. Jaunde, 800 m., *Zenker & Staudt* 581; Bassa near Duala, *Dalziel* 8155; Bipinde, *Zenker* 1672, 2811, 4336, 4808, 4894, 4960; Batanga, *Bates* 23; Edea, *Buesgen* 364; without locality, *Bates* 686.

GABON. Gabon River, *Mann* 997; Sierra del Crystal, *Mann* 1708; Angoni, 70 miles east of Gabon, *Bates* 564.

FRENCH CONGO. Loango, *Soyaux* 135.

PORTUGUESE CONGO. Mayumbe, Hombe region, R. Lufo, *Gossweiler* 7954; Nkanda Mbaku, *Gossweiler* 9045.

BELGIAN CONGO. Luala, *Vanderyst* 10018; Bingila, *Depuis* s.n.; Sanda, *Gillet* 3318; Ganda-Sundi, 350 m., *Goossens* 1088, 1137; Kizu, *Willems* 199; Bokala, *Vanderyst* s.n.; valley of the Djuma, *Gillet* 2841b, 2864; Nioki, *Goossens* 6094; Eala, *Pynaert* 866; Mongo near Eala, *Laurent* 1099; Likimi, *Malchan* 4; Mobwasa, *Reynaert* 1457; island above Upoto, *Laurent* s.n.; Dondussana, *Moréhan* 850, 901; Bomane, *Laurent* 1425; Nala, *Seret* 757; between Ipamu and Panga, *Vanderyst* 9550; near Ipamu, *Vanderyst* 9937; Panga, *Bequaert* 1533; Avakubi, *Bequaert* 1913; Penghe, *Bequaert* 2094, *Putnam* 88; Bena-Dibele, *Flamigni* 126; Port Franqui, *Vanderyst* 24354, 24385; Kimbwa, *Vanderyst* s.n.; Kito., *Georgery* 209; between the Lubile and the Lukaya, *Vandermeiren* s.n.; without locality, *Briey* s.n.

UGANDA. Luala, 1200 m., *Dummer* 3976; Mubango, 1200 m., *Dummer* 4465; Wini, Toro, 1050 m., *Bagshawe* 1039; Ngusi River, Lake Albert, 900 m., *Bagshawe* 1371; Budongo Forest, *Eggeling* 2273.

TANGANYIKA TERRITORY. Maschana, Usambara Mts., *Holst* 3494 (type of *Eranthemum Lindau* C. B. Cl.); Amani, *Warncke in Herb. Amani* 239; *Grote in Herb. Amani* 6314; Mombo, *Engler in*

Herb. Amani 3257 ; Rau Forest, Moshi, 700 m., *Lewis* 235 ; Pare District, Bombo, 1300 m., *Haarer* 1488 ; Morogoro District, Uluguru Mts., 1250 m., *Schlieben* 2695.

NORTHERN RHODESIA. Abercorn District, south-west of Lake Tanganyika, 1200 m., *Hutchinson & Gillett* 3980.

ANGOLA. Pungo Adongo, Mata de Pungo, *Welwitsch* 5177, 5192 ; Amboim, *Gossweiler* 4487.

Like *P. Ludovicianum* (Bütt.) Lindau, this species is an inhabitant of the evergreen forests, but its distribution is much wider, for it is also found in the fringing forests in the higher and drier parts of the continent.

7. *Pseuderanthemum dispernum* Milne-Redhead, sp. nov. ; ab omnibus speciebus africanis generis capsulis dispermis seminibus muricatis differt. *P. nigritianum* Lindau in Schlecht. Westafr. Kautschuk-Exped. 316 (1900), non Radlk. *Eranthemum hypocrateriforme* S. Moore in Cat. Pl. Talb. Nigeria, 140 (1913), non Roem. & Schultes.

Frutex vel suffrutex, magnitudine ignota. *Ramuli* parce pubescentes, demum laeves, pallidi, internodiis 0·5–4·5 cm. longis. *Folia* elliptica vel anguste obovata, leviter acuminata, subacuta, basi in petiolum attenuata, usque 13 cm. longa et 4·5 cm. lata, subglabra vel parcellissime hirsuta, supra cystolithis minutis instructa ; petiolus usque 1 cm. longus ; folia superiora minora, suborbicularia, apiculata, circiter 1·5 cm. diametro. Inflorescentiae usque 20 cm. longae, terminales vel axillares, interruptae, simplices vel basi furcatae ; rhachides brevissime hirsutae et stipitato-glandulosae ; nodi multi, 2–3-flori ; internodia usque 2·5 cm. longa ; bractae et bracteolae lineari-subulatae, minutae, circiter 4 mm. longae, puberulae et glandulosae. *Calyx* alte 5-fidus ; segmenta lineari-subulata, circiter 6 mm. longa, puberula et glandulosa. *Corollae* tubus tenuiter cylindricus, leviter arcuatus, apice leviter inflatus, circiter 3 cm. longus et 1 mm. diametro ; limbus patens, 5-partitus, circiter 3 cm. diametro ; lobi subaequales, coccinei, ovati, 8 mm. lati. *Stamina* 2, sub fauce affixa ; filamenta brevissima ; antherae dithecae, thecis muticis, 2 mm. longae, exsertae ; staminodia 2, brevissima. *Ovarium* oblongum, circiter 2 mm. longum, 4-ovulatum ; stylus filiformis, circiter 3 cm. longus ; stigma inclusum, minutum, capitatum. *Capsula* disperma, ovulis inferioribus abortivis, circiter 15 mm. longa, inferne in stipitem 8 mm. longum contracta, apice brevissime rostrata. *Semina* suborbiculata, plano-compressa, 4 mm. diametro, brunnea, muricata, praecipue in latere interiore.

NIGERIA. Oban, *Talbot* 1552 (type in Kew Herb.) ; Okuri, Cross River, *Holland* 172. Agoi Efut—Ukwop Eyere, *Rosevear* 30/31.

BRITISH CAMEROONS. Meandja, 600 m., *Schlechter* 12681.

CAMEROONS. Bipinde, *Zenker* 1667.

In general appearance this species is very similar to *Ruspolia decurrens* (Hochst. ex Nees) Milne-Redhead, and agrees with it in possessing glandular hairs on the inflorescence, but is easily separable on account of its bilocular anthers, its small two-seeded capsules and its seeds. Strange to say it has not been confused with this species but has been found in herbaria both under *Ruspolia hypocrateriformis* (Vahl) Milne-Redhead and *Pseuderanthemum tunicatum* (Afzel.) Milne-Redhead. Holland described the flowers as being scarlet with a dark centre, and Schlechter as being brick red, whilst those of *P. tunicatum* are white spotted or flushed with mauve. Its distribution appears to be restricted to a small area about the Gulf of Guinea.

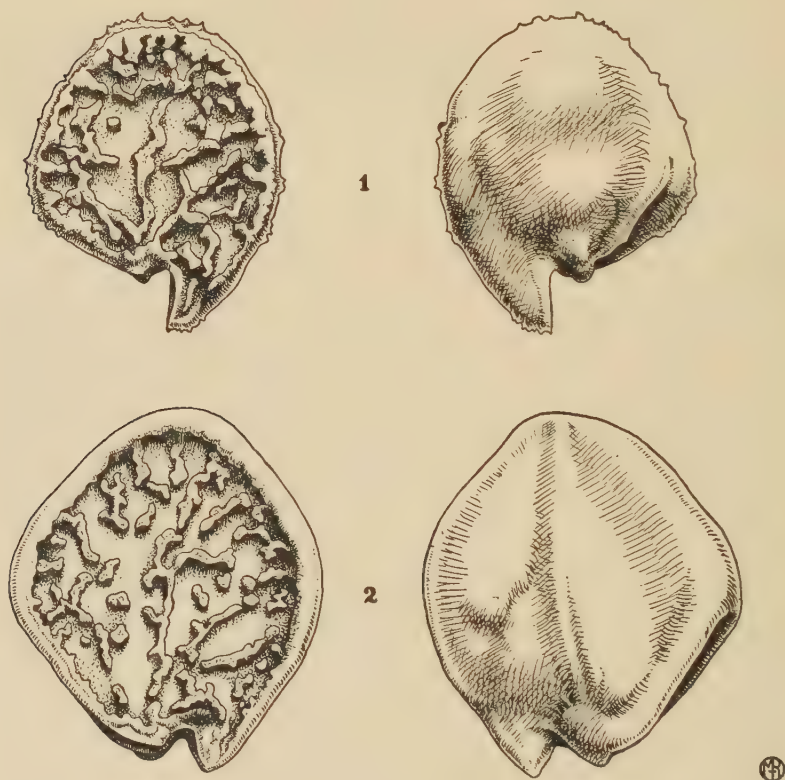


Fig. 7. Seeds of species of *Ruspolia* Lindau (all $\times 6$). 1, *R. decurrens* (Hochst. ex Nees) Milne-Redhead; 2, *R. seticalyx* (C. B. Cl.) Milne-Redhead.

KEY TO THE SPECIES OF *Ruspolia* LINDAU

Capsule normally 4-seeded.

Seeds with a marginal rim and a number of irregular raised walls on the otherwise smooth inner surface.

Inflorescence up to 3 dm. long ; rhachis and calyx with stalked glands as well as hairs ; capsule less than 3 cm. long ; seeds with marginal rim, lower than the irregular walls on the inner surface, transversely less than 6 mm. in diameter..... 1. *decurrens*

Inflorescence up to 1.5 dm. long ; rhachis and calyx without stalked glands ; capsule more than 3 cm. long ; seeds with marginal rim higher than the irregular walls on the inner surface, transversely more than 6 mm. in diameter 2. *seticalyx*

Seeds with a marginal rim to the otherwise smooth inner surface ; capsule about 4 cm. long.

Seeds round in outline with a thick rather wide rim, transversely 7 mm. in diameter.....3. *hypocrateriformis*

Seeds rather angular in outline, with a thin and narrow rim, transversely 8-9 mm. in diameter...3a. *hypocrateriformis* var. *australis*

Capsule normally 2-seeded, about 4 cm. long ; seeds with a rather irregular wide marginal rim, and a longitudinal ridge crossing the otherwise smooth inner surface 4. *pseuderanthemoides*

ENUMERATION OF THE SPECIES OF RUSPOLIA LINDAU

1. **Ruspolia decurrens** (Hochst. ex Nees) Milne-Redhead, comb. nov. *Eranthemum decurrens* Hochst. ex Nees in DC. Prodr. **11**, 453 (1847) ; A. Rich. Tent. Fl. Abyss. **2**, 158 (1851) ; C. B. Cl. in Dyer, Fl. Trop. Afr. **5**, 170 (1899) ; Broun and Massey, Fl. Sudan, **343** (1929). *Eranthemum senense* Klotzsch in Peters, Reise Mossamb. Bot. **219** (1861) ; C. B. Cl. in Dyer, Fl. Trop. Afr. **5**, 171 (1899). *Pseuderanthemum decurrens* Radlk. in Sitzb. Math.-phys. Cl. Akad. Wiss. Muench. **13**, 286 (1883) ; Lindau in Engl. and Prantl, Pflanzenfam. **4**, 3B. 330 (1895) ; A. Chev. Études. Fl. Afr. Centr. Franç. **1**, 236 (1913). *Pseuderanthemum senense* Radlk. in Sitzb. Math.-phys. Cl. Akad. Wiss. Muench. **13**, 286 (1883) ; Lindau in Engl. and Prantl, Pflanzenfam. **4**, 3B, 330 (1895).

FRENCH EQUATORIAL AFRICA. Upper Shari, Gribingui, Chevalier 6453 ; Upper Oubangui, between Mandjaffa and Bousso, Chevalier 10461.

ANGLO-EGYPTIAN SUDAN. Kordofan, Kotschy 276 (type) ; Pfund 435, 444 ; District of Dilling, Andrews 16 ; Kharraba, Aylmer 15 ; Dimo, near Wau, Schweinfurth 4264 ; Blue Nile, Muriel 4/51 ; Shambe, Bahr el Jebel, Broun 1424.

ABYSSINIA. Tacaze River, Schimper 773 ; without locality, Quartin-Dillon & Petit 2398 ; Aethiopia, without locality, Kotschy 450.

TANGANYIKA TERRITORY. Malendula, east of Mahenge, 400 m., Schlieben 2342 ; Lindi District, Mt. Mtandamula, Busse 2719.

PORTUGUESE EAST AFRICA. Rios de Sena, *Peters* s.n. (type of *Eranthemum senense* Klotzsch); Lupata, *Kirk* s.n.

NYASALAND. Near Mt. Chiradzulu, *Cameron* 184.

SOUTHERN RHODESIA. Hot Springs, *Myers* 689.

NORTHERN RHODESIA. Livingstone District, Bombwe Forest, *Martin* 238.

The indumentum character used by Clarke to separate *Eranthemum senense* Klotzsch from *E. decurrens* Hochst. ex Nees breaks down completely in the light of additional material, and the writer finds himself forced to unite these two species, in spite of their interrupted distributions, for the species is as yet entirely unknown from Uganda, Kenya Colony and northern Tanganyika Territory.

2. *R. seticalyx* (C. B. Cl.) Milne-Redhead, comb. nov. *Eranthemum seticalyx* C. B. Cl. in Dyer, Fl. Trop. Afr. **5**, 172 (1899). *Pseuderanthemum seticalyx* Stapf in Bot. Mag. **135**, t. 8244 (1909).

BELGIAN CONGO. Katanga, R. Choma between Lakes Moero and Tanganyika, *Descamps* s.n.; Kitchema, *Descamps* s.n.; Pweto, Lake Moero, *Robyns* 1997.

TANGANYIKA TERRITORY. Shinyanga, 1200 m., *Bax* 342; *Burt* 5118, 5195; Singida District, Matelele, 1200 m., *Burt* 1383; Mwapwa, *Hornby* 117, *Burt* 3878; Mbeya District, Mbozi, Kitete, 1200 m., *Davies* 488; Mts. east of Lake Nyasa, *Johnson* s.n.; Namguru, near Lindi, *Busse* 2960. Lake Rukwa, Milepa, *Michelmores* (Hort. Kew).

NYASALAND. Kondowe to Karonga, 600–1800 m., *Whyte* s.n. (type); Songue to Karonga, 500–600 m., *Whyte* 6; Zomba Rock, *Whyte* s.n.; Manganja Hills near Shibisa [Chikwawa], 60–90 m. *Kirk* s.n.; without locality, *Buchanan* 302, 1204; Blantyre, *Simon* s.n.; Likoma Island, *Johnson* 94; Nyika Plateau, Nwanemba, 2400 m., *McClounie* 102.

SOUTHERN RHODESIA. Kariba Gorge on the Zambezi, *Haviland* in *Herb. Eyles* 4920.

R. seticalyx is a distinct species recognised at once by its seeds. It is confined to the highlands of eastern Africa. A specimen collected by Schlieben (no. 2047) at Mahenge, Tanganyika Territory, comes very near to this species, but differs from the typical plant in its longer and more robust inflorescence, its wider bracts and its calyx pubescent inside. Until its fruits and seeds are known the writer prefers to leave it undescribed.

3. *R. hypocrateriformis* (Vahl) Milne-Redhead, comb. nov. *Justicia hypocrateriformis* Vahl, Enum. **1**, 165 (1805); Schumacher & Thonn. Beskr. Guin. Pl. **11** (1827). *Eranthemum hypocrateriforme* Roem. & Schultes, Syst. **1**, 175 (1817); Nees in DC. Prodr. **11**, 454 (1847); Benth. in Hook. Niger Fl. 484 (1849); T. Anders. in Journ.

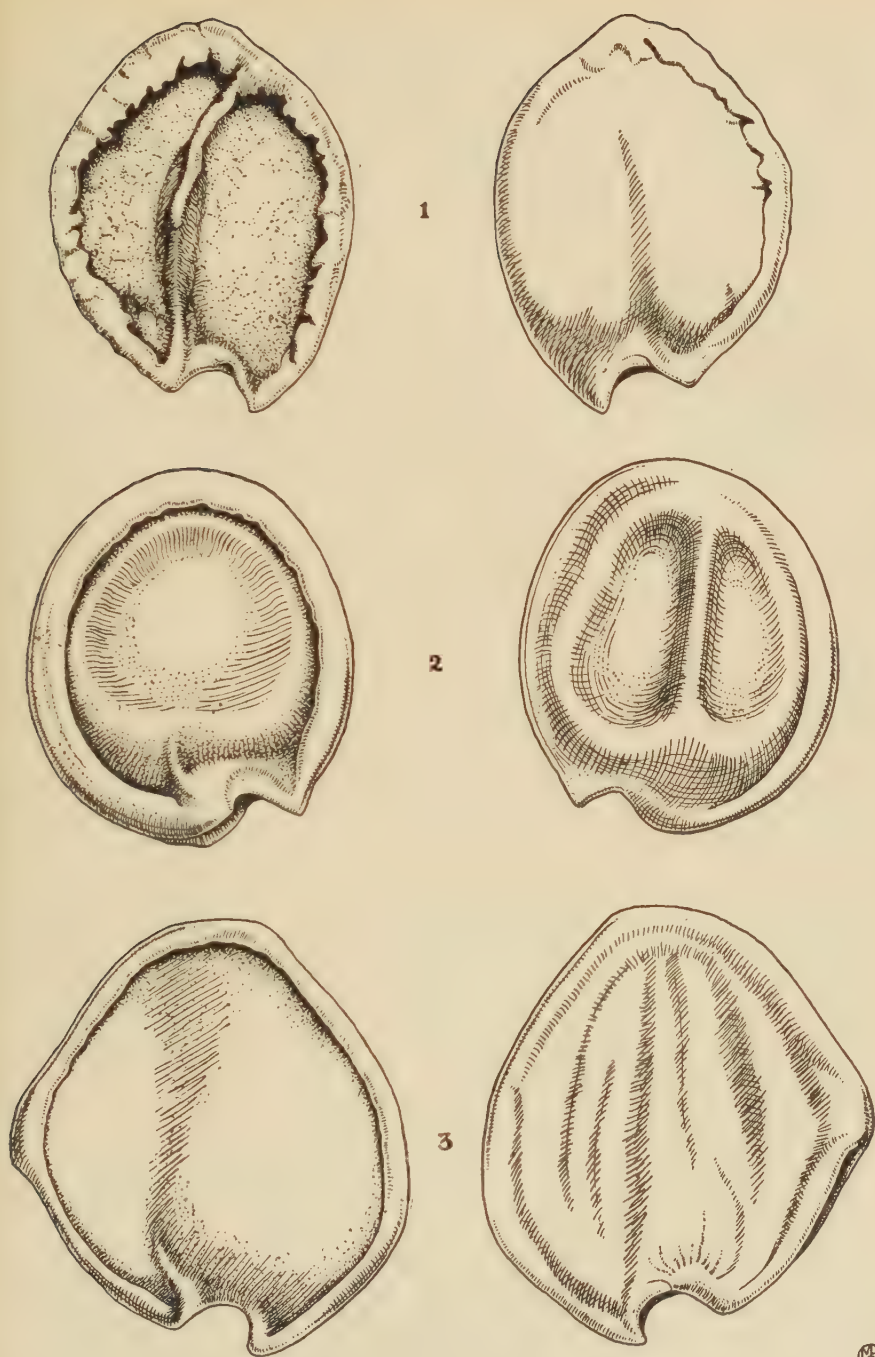


Fig. 8. Seeds of species of *Ruspolia* Lindau (all $\times 6$).
 1, *R. pseudevanthemoides* Lindau; 2, *R. hypocrateriformis* (Vahl)
 Milne-Redhead; 3, *R. hypocrateriformis* var. *australis* Milne-Redhead.

Linn. Soc. Bot. **7**, 52 (1864) ; Hook. f. in Bot. Mag. **101**, t. 6181 (1875) ; C. B. Cl. in Dyer, Fl. Trop. Afr. **5**, 171 (1899) ; De Wild. in Bull. Jard. Bot. Brux. **7**, 75 (1920) ; Irvine, Pl. Gold Coast, 183 (1930) ; Hutch. & Dalz. Fl. W. Trop. Afr. **2**, 262 (1930). *Eranthemum affine* Spreng. Syst. **1**, 89 (1825). *Pseuderanthemum hypocrateriforme* Radlk. in Sitzb. Math.-phys. Cl. Akad. Wiss. Muench. **13**, 286 (1833) ; Lindau in Engl. & Prantl, Pflanzenfam. **4**, 3B. 330 (1895), p.p. ; S. Moore in Journ. Bot. **68**, suppl. 2, 136 (1930).* *P. decurrens* A. Chev. Expl. Bot. Afr. Occ. Franç. **1**, 500 (1920), non Radlk.

SENEGAL. Dakar, 15 m., *Vigne* 1773 ; *Vermoesen* 1012 ; Casamance, Carabane, *Chevalier* 2795.

SIERRA LEONE. Without locality, *Vogel* 159 ; *Winwood Reade* ; *Smeathman* ; *Unwin & Smythe* 22 ; *Wallia* on Scarcies River, *Scott-Elliot* 4451 ; near top of Sugarloaf, *Scott-Elliot* 4028.

GOLD COAST. Accra, *Don* 11 ; *Dalziel* 72 ; *Deighton* 617 ; Aburi Hill, 180 m., *Lloyd Williams* 288 ; Aburi, *Howes* 1015 ; Achimota, *Irvine* 144 ; without locality, *Farmer* 469 ; Volta River District, 60–120 m., *Moor* 240.

TOGO. Lome, *Warnecke* 7, 8, 386.

NIGERIA. Eruva, *Rowland* s.n.

BELGIAN CONGO. Leopoldville, *Vanderyst* 3018 ; Yambata, *De Giorgi* 1753 ; *Vermoesen* 130 ; Kisantu (cult.) *Vanderyst* 13568.

ANGOLA. Cuanza, between Casal and Mubela, *Gossweiler* 8418.

3a. *R. hypocrateriformis* (Vahl) Milne-Redhead var. *australis* Milne-Redhead, var. nov. ; habitu *R. hypocrateriformis* (Vahl) Milne-Redhead similis sed seminibus majoribus margine angustiore differt.

Frutex laxis ; rami arcuati, usque 3 m. longi ; ramuli leviter angulati, cortice pallide brunneo tecti, novelli pilis brevibus crispidulis induti. *Folia* ovata, leviter acuminata, subacuta, basi in petiolum attenuata, usque 12 cm. longa, 5 cm. lata, novella puberula, nervis leviter hirsutis, demum glabra, supra cystolithis minutis dense instructa ; petiolus usque 2 cm. longus. *Inflorescentiae* paniculatae, multiflorae, congestae, usque 6 cm. longae ; bractae et bracteolae lanceolatae vel anguste deltoideae, acutae, 4–11 mm. longae, inferne 1–2 mm. latae, puberulae, ciliatae. *Calyx* alte 5–fidus, 7 mm. longus ; segmenta lineari-subulata, circiter 6 mm. longa, leviter puberula et minute ciliata. *Corollae* tubus tenuiter cylindricus, leviter arcuatus, apice oblique infundibuliformis, usque 2.8 cm. longus et 1.5 mm. diametro, extra parce glandulosus ; limbus patens, 5-partitus, circiter 2 cm. diametro ; lobi subaequales, coccinei, obovati, circiter 9 mm. longi, 5 mm. lati. *Stamina* 2, sub fauce affixa ; filamenta circiter 3 mm. longa ; antherae monotheceae, loculo 1 mm. longo mutico, exsertae. *Ovarium* conicum,

* for var. *breviflorum* S. Moore see p. 274

circiter 3 mm. longum, 4-ovulatum; stylus filiformis, glaber, circiter 2.8 cm. longus; stigma exsertum, minutum, capitatum. *Capsula* 4-sperma vel abortu disperma, usque 4 cm. longa, inferne in stipitem 15 mm. longum contracta, apice acuta, vix rostrata. *Semina* plano-compressa, suborbiculata vel rotundato-triangularia, basi inaequale biloba, lobo minore obtuso-hilifero, lobo majore apice leviter incurvo acuto, laevia, latere interiore margine angusto corneo instructa, usque 9 mm. diametro.

TRANSVAAL. Zoutpansberg: Wylies-poort, April 1934, *Schweickredt & Verdoorn* 441 (type in Nat. Herb. Pret.):—shrub with arching branches over 3 m. long, hanging over stones; flowers scarlet; anthers 2, scarlet, exserted; corolla-tube cricked at the throat; corolla-lobes abruptly spreading, three somewhat larger than the remaining two. Wylies-poort, hanging down shrubby bank by roadside, 15 April 1934, *Schweickerd & Verdoorn* 673:—flowers scarlet. Wylies-poort, 28 April 1931, *Pole Evans* 3338 (34), in part.

The writer finds that it is impossible to consider this southern *Ruspolia* anything but a variety of the West African *R. hypocrateriformis* as in the flowering state they are quite indistinguishable from dried material.

A specimen collected by Miss Myres (no. 680) in the Melsetter District of Southern Rhodesia may be *Ruspolia hypocrateriformis* var. *australis*, but it is in young fruit and the seeds are too immature for certain identification. *Monro* 2335 in the British Museum Herbarium may also be this variety, but here again the material is too young.

4. *R. pseuderanthemoides* *Lindau* in Ann. Istit. Bot. Roma, 6, 80 (1896). *Eranthemum hypocrateriforme* *Rendle* in Journ. Bot. 34, 398 (1896), non Roem. & Schultes.

ABYSSINIA. R. Dawa at Uelbe, *Riva* 1418 (type); Sheik-husin, *Donaldson Smith* s.n.

DOUBTFUL SPECIES.

Eranthemum plumbaginoides *P. Maury* in Journ. de Bot. 2, 264, cum ic. (1888).

GABON. Libreville, *Chateau*.

The species was described from a cultivated plant, and no specimen appears to have been preserved. The description and illustration are not sufficiently detailed to allow of definite identification, but the writer feels certain that *E. plumbaginoides* is either *Pseuderanthemum Lindavianum* or a form of *P. tunicatum*.

Pseuderanthemum hypocrateriforme Radlk. var. **breviflorum** S. Moore. in Journ. Bot. 68, suppl. 2, 136 (1930) = **Pseuderanthemum kewense** L. H. Bailey, Gentes Herb. 1, 130 1923. *Eranthemum atropurpureum* Hook. f. in Bot. Mag. 128, t. 7839 (1902), non Bull.

The above variety was founded on *Gossweiler* 1524. In his notes accompanying the specimen, Gossweiler says "A shrub some 4 ft. high, sparingly branched; leaves dark purplish red above glossy, purplish green beneath, flowers white with violet markings round the throat. Cultivated at Loanda Public Gardens brought from Cabinda (Portuguese Congo) by myself where I received it from the Government Garden." This is undoubtedly *P. kewense*, a species which is probably a native of one of the Polynesian islands, and which has been cultivated in Botanic Gardens for some years as an ornamental foliage plant.

XXVIII—NEW OR LITTLE KNOWN PLANTS FROM SOUTH INDIA: VII *

N.B.—The localities in round brackets after the name of the species indicate the locality noted in the Flora of the Madras Presidency.

Hibiscus canescens Heyne [Malvaceae];
(Deccan and Carnatic).

TINNEVELLI DISTRICT: in the hills near Mundanthorai, *E. Barnes* 1231. Leaves and flowers have a tendency to droop.

Quisqualis malabarica Bedd. [Combretaceae];

This species is described as a large climber with opposite leaves, but Dr. Barnes has collected erect specimens in flower, under 20 inches in height, on which the leaves are mostly alternate.

TRAVANCORE: at the foot of the Ponmudi Hills, in evergreen forest, fls. May, *E. Barnes* 1225, 1226.

Strobilanthes Wightianus Nees [Acanthaceae];

Dr. E. Barnes records a general flowering of this species on the Nilgiri Downs in 1934.

Andrographis elongata T. And. [Acanthaceae];
(W. Ghats, hills of Tinneveli).

CHINGLEPUT DISTRICT, near Tambaram: at Puthur, fls. and frt. March, *E. Barnes* 92; at Mullumalai, fls. & frt. Feb., *E. Barnes* 1061. There is also a sheet in the Kew Herb. collected at Chingleput (*Gamble* 13865) which is noted "cult.?" in view of Dr. Barnes' find, this specimen is also probably wild.

* Continued from K.B. 1935, 160.

Peperomia dindigulensis *Miq.* [Piperaceae] ;

NILGIRI HILLS : Ouchterlony Valley, fls. May, *E. Barnes* 1119, 1209.

Upper surface of fleshy leaves flat, dark-olive-green, lower surface convex, dark-red.

Eulophia nuda *Lindl.* [Orchidaceae] ;

COORG : Mercara, fls. June, *E. Barnes* 1254. Flowers dark-liver coloured.

Rhynchostylis latifolia *C. E. C. Fischer* [Orchidaceae] ;

(Mysore at Cardamonai)

COORG : near Mercara, fls. June, *E. Barnes* 1210, 1218.

Sepals bright-green, becoming brownish-purple along the keel ; lateral petals very light-green, almost white, with brownish markings on the back ; lip violet round the mouth, lobe on underside of lip and sac white.

Ariopsis peltata *Nimmo* [Araceae] ;

(W. Coast and Ghats ; from sea-level to 4,000 ft.)

TRAVANCORE : near Munnar, on rocks at 5,000 ft., fls. May, *E. Barnes* 1087. Spathe light-cream coloured, speckled externally with brownish-pink especially on the veins and a few reddish freckles on the inside ; ovaries white with brownish-green ridges or pale-green with darker ridges ; stigmas white ; ♂ fls. strawberry-coloured, pale-yellow round the pores.

Arisaema attenuatum *E. Barnes et C. E. C. Fischer*, sp. nov. [Araceae-Araeae] ; ab *A. tylophoro* C. E. C. Fischer folioliis sessilibus nervis numerosioribus marginibus undulatis, spathae limbo elongato-triangulari, cauda nec spathae nec spadiceis capitata differt.

Dioecious, succulent, glabrous *herb.* *Tuber* oblate, 2-3 cm. diam., covered below with the remains of the old tuber. *Cataphylls* 3 or more, membranous, innermost up to 21 cm. long, beautifully mottled by longitudinal dark-purple markings on a greenish and brown striated ground. *Leaf* solitary ; petiole rather slender, up to 80 cm. long, often very conspicuously mottled, the basal 2/3 closely sheathing the peduncle, the 2 edges overlapping and united for a few centimetres at the base by a membrane ; leaflets radiate, 9-13 in ♀ plants and 6-12 in the ♂, elliptic-lanceolate to oblanceolate, finely acuminate, tapering at the base, sessile, 12-22 cm. long 2-5.5 cm. wide, dark-greenish and dull above, slightly lighter and somewhat glossy below, primary nerves 18-25, 3-4 mm. apart, arising at an angle of 45° from the midrib, running into an intramarginal vein 2-5 mm. from the strongly undulate margin. *Peduncle* slender, entirely enclosed in the petiole-sheath or exerted up to 10 cm. *Tube of spathe* cylindric or very slightly widened upwards, 7-9 cm.



Arisaema attenuatum Barnes et Fisch. ♀ inflorescence $\times 3$.

1. showing one ♂ flower above ♀ inflorescence. 2. showing lowest neuters tipped with rudimentary anthers.

long, 1–1.5 cm. diam., mouth not or slightly revolute, base with a small aperture between the edges, outside with bright-green stripes on a whitish ground, inside glossy with the posterior stripes dark-purple; *limb* elongate-lanceolate, 4–6 cm. long, long-acuminate, the apical portion curved over and pointing downwards, with a large roundish white patch at the base, uniform bright-green above with a few purplish markings at the junction of the green and white. *Spadix* 8–10 cm. long, tapering more or less uniformly from base to the slender, acute tip, the last centimetre or so curved at right angles and shortly exserted from the mouth of the spathe; appendix green, the tip yellowish-green and minutely warted. *Female inflorescence* 2 cm. long; ovaries crowded, subglobose, green; stigma almost sessile, white-papillose; ovules 5–7; neuters few to many scattered over a length of 2–3 cm. above the ovaries, slender, erect, subulate, 4–10 mm. long, green, sometimes a few of the lowest purple-tipped. *Male inflorescence* 3–4 cm. long, starting from the base or leaving 3–4 mm. of naked spadix below, flowers scattered or crowded at the base and distant above, consisting of 1–7 sessile, purple anthers opening by an apical pore; pollen-grains spherical, slightly echinate, purple, 0.015 mm. diam. *Fruit* not seen.

TRAVANCORE: High Range, plentiful in evergreen forest and shady grassy places near Munar, 5,000 ft., flowers May, *E. Barnes* 1193 (♀, type sheet, and inflorescence in spirit in Herb. Kew.), 1079 (♂ & ♀), 1145, 1198 (whole plants), 1200 (leaf).

Of 58 plants 40 were ♂, 18 ♀; about half the ♂ had 7 or 8 leaflets and half the ♀ had 10.

There has been some controversy regarding the origin of the neuters in *Arisaema* and allied genera. Engler (Pflznr. IV. 23 F, 17)

appears to imply that in dioecious species the neuters on the ♀ plants are pistillodes. This would not appear to be the case in the present species. On the ♀ spadix on the sheet *Barnes* 1079, there is a single ♂ flower immediately above the uppermost ovary. On sheet 1193, on one of the ♀ spadices several of the lowest neuters are tipped with a definite rudimentary purple anther, and several higher ones are provided with minute purple-knobbed tips. It is evident, therefore, that these are rudimentary ♂ flowers and it would seem that this dioecious species has evolved from a monoecious one through the degeneration of the ♂ flowers into neuters.

***Arisaema Barnesii* C. E. C. Fischer [Araceae] ;**

NILGIRI HILLS : Ochterlony Valley, fls. May, *E. Barnes* 1208.

Dr. Barnes makes the following observations on this species : " Is a small slender plant at higher altitudes but becomes a very large, rather succulent one lower down. Many plants were much larger than the one sent." On the plant referred to the leaf has 9 leaflets up to 32 cm. long, 11.5 cm. wide ; primary nerves up to 1.5 cm. apart, intramarginal vein up to 1 cm. from the margin ; petiolules up to 3.5 cm. long ; tube of spathe 8.5 cm. long, limb 6 cm. long with a tail 6 cm. long ; ♀ spadix 9.5 cm. long, the floriferous portion 3 cm. long.

***Arisaema peltatum* C. E. C. Fischer, sp. nov. [Araceae-Araeae] ;**
A. Barnesii C. E. C. Fischer simile, sed foliolis sessilibus angustioribus, spatha minore, limbo erecto, spadicebus nec fusiformibus nec capitatis, stylo longiore, stigmatibus peltatis.

A dioecious, glabrous *herb.* *Tuber* subglobose, 1–2 cm. diam., flesh white. *Cataphylls* 3, membranous, greenish mottled with dark-purple, innermost up to 15 cm. long. *Leaf* solitary ; petiole up to 60 cm. long, the lower half sheathing the peduncle, conspicuously mottled ; leaflets radiate, 7–11, narrowly elliptic-lanceolate, acuminate or caudate-acuminate, base tapering, sessile, 9–19 cm. long, 1.8–3 cm. wide, green above, whitish below, lateral nerves 12–16, impressed above, arising at an angle of 45° with the midrib, uniting with a longitudinal vein 2–3 mm. within the entire or more or less erose, revolute margin. *Peduncle* slender, rather shorter than the petiole. *Tube of spathe* narrowly funnel-shaped, 3.5–5 cm. long, limb ovate-lanceolate, 4–5 cm. long, tapering into a slender tail 2.5–4 cm. long, the limb bent forward and then upcurved with the tip erect. *Spadix* straight, slightly longer than and exerted from the tube of the spathe, similar in both sexes, slightly larger in the ♀ rather slender, very slightly enlarged above the inflorescence and thence very slightly tapered to a blunt tip. *Female inflorescence* narrowly conical, 2.5 cm. long (only one seen) ; ovaries crowded, subglobose ; style columnar, $\frac{1}{4}$ – $\frac{1}{3}$ as long as the ovary ; stigma peltate, minutely papillose ; ovules 3–4 ; neuters about 25, extending over 1.5 cm. of the spadix, slender, subulate, acuminate, erect,

up to 1.2 cm. long. *Male inflorescence* 1.7–2 cm. long, flowers scattered or often dense below, consisting of 2–8 anthers on a short column, opening by apical pores; neuters 0. *Fruit* not seen.

TRAVANCORE: High Range, near Munnar, 5,000 ft., flowers May, *E. Barnes* 1147 (♂, type in Herb. Kew.), 1115 (3) (♀ inflorescence), 1142, 1213 (inflorescence in spirit); Munnar-Naimakad, 5000–6000 ft., *E. Barnes* 1141; Munnar Pullivasal, 4500 ft., *E. Barnes* 1146.

***Arisaema Wightii* Schott** [Araceae];

(Nilgiri Hills)

TRAVANCORE: near the summit of Anaimudi, fls. May, *E. Barnes* 1107, 1108, 1160; often in crevices of rocks; usually with a single leaf.

***Ophioglossum lusitanicum* Linn.** [Filices-Ophioglossaceae];

(This fern is not recorded in Beddome's Ferns of Brit. Ind., but he probably included specimens of it under *O. nudicaule* Linn. f. The habitat of that species, however, is stated as "Anamally Forests, 2500 ft., and elsewhere on the Western Mountains." *O. lusitanicum* Linn. has now been found near the E. Coast).

CHINGLEPUT DISTRICT: near Vandalur, amongst grass in open places and in scrub jungle, 200 ft., *E. Barnes* 298.

XXIX—NOTE ON THE DISTRIBUTION OF *HYPTIS* IN THE OLD WORLD. CARL EPLING (University of California).

The genus *Hyptis*, as is well-known, is characteristically American, ranging from California and Florida to Argentina. However, certain species of the sections *Mesosphaeria* and *Cephalohyptis* are widely distributed as weeds in the tropics, not only of America, but of the Old World, where they are often collected and frequently misnamed. It is hoped that the following notes will assist in their determination.

***H. pectinata* Poit.** Ranges in tropical Africa from Sierra Leone eastward to Abyssinia and southward to Angola, Rhodesia, Tanganyika, Nyasa and Madagascar. It is rarely collected in the East Indies, having been found in Java and Guam.

***H. spicigera* Lam.** (*H. americana* Urban, non *H. americana* Briq.). Widely distributed throughout the East Indies where it is more often collected than in the Americas, and in Africa where it has been found in Senegal, Sierra Leone, Nigeria, the Sudan, the Congo, Nyasa and Madagascar. It is also found in Guam. It is probably Brazilian in origin.

***H. suaveolens* Poit.** Abundant throughout the East Indies from Hong Kong and Formosa to Queensland and westward to Bengal and Madras. In Africa it occurs at least in Senegal, French Guinea, Sierra Leone, Liberia and Nigeria.

H. atrorubens *Poit.* var. **africana** Epling var. nov.; a typo floribus paulo majoribus, calycum maturorum tubis 5–8 mm. longis subaequaliter cylindratis, nuculis paulo majoribus rugosioribus quam gynobaseos columella paulo brevioribus differt.

SIERRA LEONE. Near Kitcham, *Scott Elliot* 4343 (typus in Herb. Kew.).

Specimens of Don and Afzelius in the British Museum are more hairy than the American plants and have stouter calyx-teeth. Found in Senegal, Sierra Leone and Liberia. This is the only form of *Hyptis* which suggests the possibility of an Old World nativity. Although abundantly collected in the American tropics I have seen no specimens quite comparable with the African.

H. rhomboidea *M. & G.* (*H. capitata* var. *mexicana* Briq. *H. decurrens* Epling). A native of Mexico and now distributed through the East Indies from Hainan and Formosa to the Philippines and Borneo. The species is commonly confused with *H. capitata* from which it may readily be distinguished by the decurrent lines of pubescence on the angles of the stems, the narrower more rhomboidal leaves and larger flowers. I do not believe that *H. capitata* occurs in the Old World.

H. mariannarum *Briq.* A native of Mexico also found in Guam and named from an early collection from that island.

H. conferta *Pohl* var. **angustifolia** *Benth.* Common throughout the American tropics. Has been collected in Luzon.

H. brevipes *Poit.* There are three forms which are commonly referred to *H. brevipes*. The first of these, the plant actually named by Poiteau as may be learned by examination of his type at Paris, is characterized by slender calyx-teeth which are predominantly 1.5–2 mm. long, or even more. The capitula are borne on peduncles which are 3–15 mm. long, rarely if ever longer. The pubescence of the plant, while sparse, is seen to be of a certain order when viewed with a lens. On the upper part of the stem it is always ascending and appressed. The texture of the leaves is also characteristic. The form thus characterized is widely distributed throughout the East Indies, from Hong Kong and Formosa to the Celebes, Borneo, Sumatra and Java. It occurs widely in the New World in South America, the Carribean Islands, Central America and Mexico. It has not been collected in Africa.

H. lanceolata *Poir.* A second form is, for me, clearly defined. This is the plant named *H. lanceolata* by Poiret. An authentic specimen is preserved at Paris. While very similar in general aspect to *H. brevipes*, it will be found on examination that the calyx-teeth are shorter and blunter than those of that species, ranging from 1–15 mm. in length, rarely as much as 1.6 mm. As a result, the capitula appear more dense and compact than those of *H. brevipes*. They nevertheless average somewhat more in diameter and are borne on peduncles 0.5–3.5 cm. long. The leaves of this form are usually

glabrous or nearly so and the stems if pubescent are very sparsely so, with appressed ascending hairs. The leaves have a different texture and the plant once recognised has a different aspect. It occurs in the New World in the Guianas, where it is very possibly native, in Bahia, on Trinidad and the Windward Islands, and in Guatemala and Honduras. The only place where it comes in contact with *H. brevipes* is in Bahia and here dubious and apparently intermediate forms have been collected. In the Old World, its distribution is wholly distinct from that of *Hyptis brevipes*, it being confined to Africa, ranging from Ashanti to the Uganda and Nyasa and southward to Angola. It never appears in the East Indies, in Mexico or in Cuba.

H. lanceifolia Schum. The third form, which is less clearly defined, is also of narrower distribution. It was named *H. lanceifolia* by Schumacher. An apparently authentic specimen is at Copenhagen. It is more or less intermediate between the two previously characterized, resembling *H. lanceolata* more in habit and nature of the capitula and calyx teeth, but having a pubescence more like that of *H. brevipes*, but somewhat finer and usually much denser. Unlike that form the hairs on the upper part of the stem are not appressed, but are tangled and woolly. If it occurred everywhere in company with one or the other of these forms it might be dismissed at least provisionally as a variant of one or the other. Its distribution in Africa is much the same as that of *H. lanceolata*, ranging from Senegal to Uganda, Nyasa, Tanganyika and Angola. And judging from its occurrence there it is doubtless an introduced plant. In the New World where it is native, however, it occurs in Cuba, in Pinar del Rio and on the Isle of Pines, a region where I have observed a number of endemic species of *Labiatae*. In this locality it is very well marked and stable. While *H. brevipes* occurs in Cuba, *H. lanceolata* does not. In view of these facts therefore, I have preferred to maintain these three forms, particularly since they are already named as species, in the belief that ultimate field or garden knowledge of all three forms will discover more weighty differences than appear in the dried specimens. The species of *Hyptis* are frequently very close, particularly in this section.

XXX—PLANTS NEW TO ASSAM : VIII*. C. E. C. FISCHER.

The previously known distribution, if any, is given between the name of the plant and its locality in Assam.

Desmodium rufihirsutum Craib [Papilionaceae].

Burma, W. China, Siam.

Garo Hills : Baghmara, 500 ft., fls. blue, Nov., Mrs. N. E. Parry 1085. Garo name : Machrukimei.

This plant was also reported from Manipur, collected by A. Meebold and named *D. longibracteatum* by Schindler, but Craib's name was published three years earlier.

* Continued from K.B. 1935, 322.

Photinia Wardii C. E. C. Fischer, sp. nov. [Pomaceae]; *P. flavidiflorae* W. W. Sm. peraffinis, sed arbuscula scandens, foliis juvenilibus inflorescentisque dense tomentosis.

A large climber, branchlets purplish-brown, furrowed (at least when dry), lenticellate, glabrous; twigs of the year fuscous-tomentose. *Leaves* elliptic, acute, cuspidate, base rounded, 8–23 cm. long, 4–9 cm. wide, midrib impressed above, prominent below, primary nerves 10–14 pairs forming a wide angle with the midrib, arching and anastomosing near the slightly revolute, narrowly cartilaginous, entire margins, young leaves black when dry, probably red in life, fulvous-flocculent-tomentose below, mature leaves coriaceous, glabrous except for the more or less hairy midrib below; petioles 1–3 cm. long, flocculent-tomentose when young, becoming glabrous and furrowed; stipules early deciduous, caudate-lanceolate, 4–5 mm. long, tomentose. *Corymbs* brachiate and somewhat flat-topped, peduncle, branches and 3–3.5 mm. long pedicels fulvous-tomentose. *Calyx* 2 mm. long, glabrous; tube funnel-shaped; lobes 5, ovate, obtuse, nearly as long as the tube. *Petals* 5, broadly oblong or sub-orbicular, obtuse, 3 mm. long, glabrous. *Stamens* about 20, slightly longer than the petals, glabrous. *Ovary* densely villous, 2-celled; styles 2, free, glabrous. *Fruit* not seen.

Delei Valley, Chibaon, 28° 10' N., 96° 30' E, abundant in the deep forest-filled gullies which score the mountain face, 4000–5000 ft., fls. cream, very fragrant, April, *F. Kingdon Ward* 8042 (type, in Herb. Kew.). "A large climbing shrub ascending to the tree-tops."

Mercurialis leiocarpa Sieb. et Zucc. [Euphorbiaceae.]

Korea, Japan, Formosa, China and Siam.

Delei Valley: Chibaon, 28° 10' N., 96° 30' E, on park-like grassy slopes and lawns under scattered great trees with *Viola*, *Coptis*, *Oxalis*, etc., 7000–8000 ft., fls. April, *F. Kingdon Ward* 8078.

Ficus Wardii, C. E. C. Fischer, sp. nov. [Moraceae]; *F. infectoriae* Linn. similis, sed foliis scaberulis, petiolis pro rata brevioribus, receptaculis sessilibus, staminibus 2 differt.

A small tree; twigs brown with a reddish tinge, glabrous, longitudinally furrowed (at least when dry), internodes near the apex mostly very short. *Leaves* alternate, chartaceous, ovate or elliptic, acute and cuspidate, base from rounded-truncate to broadly cuneate, 10–20 cm. long, 4.5–10.5 cm. wide, penninerved, midrib prominent, more so below, primary nerves 14–16 pairs, the pairs frequently opposite, the lowest pair at first ascending sharply and then spreading, not continued above the next pair, the remainder parallel, nearly horizontal at their origin and then curving widely upwards, anastomosing near the margin, slightly raised, secondaries more or less parallel to the primary, rather faint and irregular, tertiaries at right angles to the primary, more or less parallel, not quite straight, scaberulous on both faces with minute bristles, margins entire, very narrowly cartilaginous; petioles 1.5–3.5 cm. long, shallowly

channelled above and on both sides, convex below, scaberulous, the bristles denser and mixed with black (when dry) pustules above at the junction with the blade; stipules 1.3–1.7 cm. long, lanceolate, acuminate, glabrous. *Receptacles* (one kind only seen) sessile, in pairs, rarely single in the axils of the terminal leaves or of the prominent circular or oblate leaf-scars just below, nearly globose, shortly umbonate, 1–1.1 cm. diam., brown, minutely puberulous, ♂ and gall flowers mixed throughout; basal bracts minute. *Male flowers* with a pedicel 1.5–1.7 mm. long; perianth-segments 3, 1.3–1.7 mm. long, red, boat-shaped, acute, keeled; stamens 2, filaments very short, anthers short, 2-celled, cells margined. *Gall flowers* sessile or nearly so; perianth-segments 3, red, lanceolate, acute, 1.5–1.8 mm. long; gall stipitate, subglobose, 1 mm. diam.; style lateral, less than half as long as the gall, stigma capitate, puberulous. *Female flowers and fruit* not seen.

Delei Valley, Chibaon, 28° 10' N., 96° 30' E, in the lower temperate rain-forest, 6000–7000 ft., fls. April, *F. Kingdon Ward* 8048 (type, in Herb. Kew.).

Kingdon Ward 6343 from the Tsangpo Gorge near Ganpo La, 5000–6000, a small tree of 30 ft. in the lower forest, fls. Dec., seems to be the same species, though the internodes of the twigs are much longer and redder, the petioles up to 4.5 cm. long, and the receptacles, also containing only ♂ and gall flowers, are slightly larger and slightly depressed globose.

***Ficus Xiphias* C. E. C. Fischer, sp. nov.** [Moraceae]; *F. Harmandii* Gagnep. similis, foliis penninerviis nervis primariis multo numerosioribus, receptaculis glabris foliis coetaneis axillaribus, floribus masculis cum cecidiophoris passim intermixtis, staminibus 2–3 differt.

A small *shrub* or *tree*, sometimes epiphytic; branchlets slender, reddish-brown, glabrous; twigs of the year dark, at first grey-pubescent, soon glabrous, internodes 4–10 mm. long. *Leaves* alternate, chartaceous, narrowly elliptic-oblong, acute and drawn out into a finely acuminate or blunt tail 2–3 cm. long and 1–2 mm. wide at the base, base of blade cuneate or rounded, 7.5–12.5 cm. long including the tail, 1.4–2.5 cm. wide, glabrous, pale and minutely warted below, penninerved, midrib prominent below, primary nerves 12–22 pairs, parallel, straight, nearly at right angles to the midrib, uniting in a looped vein 0.5–1 mm. within the entire, slightly revolute, narrowly cartilaginous margin, ultimate reticulations fine; petioles very slender, 7–10 mm. long, at first puberulous, soon glabrous; stipules early deciduous, narrowly lanceolate, acuminate, 8–12 mm. long, glabrous. *Receptacles* (only one kind seen) usually 2, sometimes 1, in the axils of the leaves; globose when mature, shortly umbonate, 7–9 mm. diam., glabrous, ♂ and gall flowers mixed throughout; peduncle filiform, 1.4–2 cm. long; basal bracts 3, broadly ovate, obtuse, 1.8–2 mm. long. *Male flowers* with pedicels 0.8–1.5 mm. long; perianth-segments 3–4, boat-shaped, obtuse, 1–1.2 mm. long, reddish;

stamens 2-3, 1 mm. long, anthers as long as the filaments ; pistillode minute. *Gall flowers* sessile ; perianth-segments 4, oblong, boat-shaped, often curved, obtuse or with an incurved acumen, 1.3-1.5 mm. diam. ; style lateral, not reaching to the apex of the gall, with a straight or recurved linear appendage from the side of the rounded apex facing the gall. *Female flowers* and *fruit* not seen.

Delei Valley, 28° 21' N., 96° 37' E, in the rain-forests, 7000 ft., fls. May, *F. Kingdon Ward* 8224 (type, in Herb. Kew.), "a small epiphytic shrub" ; 28° 15' N., 96° 35' E, in rain-forest, southern slope, 7000-8000 ft., fls. Aug. *F. Kingdon Ward* 8556, "a small shrub or tree."

The specific name is prompted by the rough resemblance of the leaves to the fore part of the Sword fish, *Xiphias gladius*.

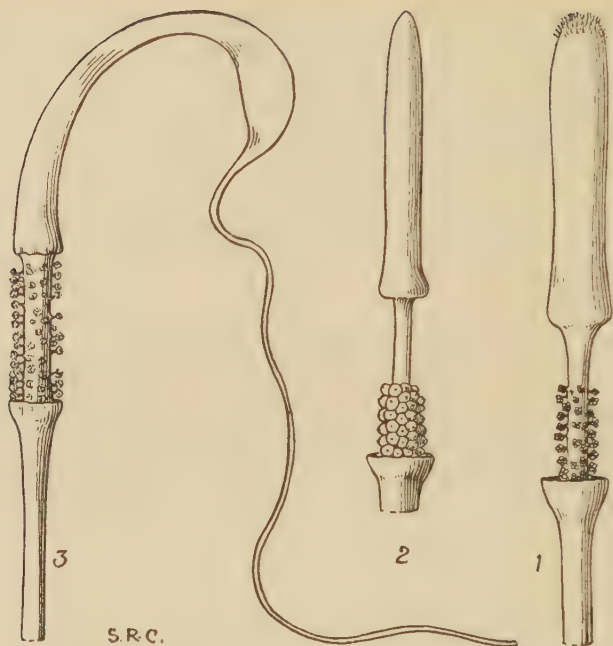
Hedychium Wardii C. E. C. Fischer, sp. nov. [Zingiberaceae] ; ab *H. urophylo* Lodd. foliis majoribus costa subtus villosa vaginis ciliatis, ligulis brevioribus, bracteis obtusis, anthera sessili, differt.

A tall *herb*. *Leaves* sessile, oblanceolate, acute, cuspidate or, shortly caudate, tapered to the base, up to 46 cm. long, 9.5 cm. wide the margins and the midrib below silky villous ; edges of the sheaths silky villous, ligules rounded, 4-10 cm. long, villous-ciliate. *In-florescence* a terminal, ellipsoid cone 10 cm. long, 3 cm. wide (1 only seen). *Bracts* coriaceous, broadly obovate, apex rounded, 4.5-5.5 cm. long, 2.6-3.8 cm. wide, sparsely villous on the back, more or less villous-ciliate, especially along the apical margin, minutely dotted, 3-flowered. *Bracteoles* oblong, truncate, 2.6 cm. long, 1.3 cm. wide hairy on the back, apical margin ciliate. *Ovary* ovoid, 1 cm. long, densely villous ; 3-celled ; ovules numerous on the inner angle of the cells. *Calyx* 3 cm. long, split on one side for $\frac{1}{2}$ its length, hairy without. *Corolla* bright-yellow, minutely pitted ; tube slender, 6-6.5 cm. long ; lateral petals linear-oblong, 2.3 cm. long, 6 mm. wide, obtuse, anterior petal 3 cm. long, 6 mm. wide, the margins for 3-4 mm. at the apex united to form an acute cone. *Lateral staminodes* narrowly spatulate, rounded, 2.3 cm. long. *Labellum* oblate emarginate, 2.6 cm. long, 3 cm. wide. *Anther* sessile, linear oblong, 8 mm. long. *Stigma* funnel- or bowl-shaped, 2 mm. diam., pilose, *Fruit* not seen.

Delei Valley, 28° 21' N., 96° 37' E, in clumps in open rocky places amongst small trees and shrubs at the bottom of the valley, 5000 ft., fls. July, *F. Kingdon Ward* 8463 (type, in Herb. Kew.). "Flowers very fragrant, in threes but opening one at a time. The bracts become filled with water, which can be poured out in streams when the plant is up-ended, and has a foetid smell."

Arisaema rhizomatum C. E. C. Fischer, sp. nov. [Araceae] ; *A. decipienti* Schott affinis, foliis minoribus haud caudatis, petiolulis brevioribus, spathae pallide virentis nigro-maculatae cauda brevior, spadiciis appendice integra obtusa differt.

Dioecious, glabrous *herb*. *Rhizome* elongate conical, 4-5 cm. long ; root-fibres branched, hairy. *Leaf* solitary (only one seen), pedate ;



1. ♂ inflorescence and spathe of *Arisaema rhizomatum* C.E.C. Fischer, nat. size.
 2. ♀ inflorescence and spadix of *Arisaema rhizomatum* C.E.C. Fischer var. *nudum* C.E.C. Fischer, nat. size.
 3. ♂ inflorescence and spathe of *Arisaema speciosum* Mart. var. *truncatum* C.E.C. Fischer, $\times \frac{1}{2}$.

petiole slender, 33 cm. long, sheathing only near the base, olive brown with scattered whitish marks, crimson near the rhizome; leaflets 5, elliptic-oblong to oblong-lanceolate, acuminate, base narrowed, median 13 cm. long, 4-5 cm. wide, with a petiolule 5 cm. long, lateral smaller with shorter petiolules, primary nerves 8-10. forming a rather wide angle with the midrib, united in a vein 3-5 mm. from the margins. *Peduncle* shorter than the petiole. *Spathe* pale-green, dotted all over with black spots; tube cylindric, 4-6 cm. long, mouth slightly revolute; limb lanceolate to ovate-lanceolate, 6-9.5 cm. long, 3-3.5 cm. wide, acuminate and prolonged into a filamentous tail up to 6 cm. long. *Spadix* straight, the tip only extending above the mouth of the tube. ♂ *inflorescence* 2-2.5 cm. long; anthers 2-3 on a short column, opening by slits. *Appendix* slender for about 1 cm. above the flowers, then truncately swollen to 3-4 times the diameter and then cylindric to a slightly enlarged rounded apex, the crown densely covered with colourless, fleshy, subulate processes. ♀ *inflorescence* nearly cylindric, about 1 cm. long; ovaries crowded, subglobose, style about half as long, stigma small, subpeltate; neuters 0. *Appendix* and fruit not seen.

Delei Valley, 28° 15' N., 96° 35' E, 11,000 ft. in *Abies-Rhododendron* forest, fls. Sept., F. Kingdon Ward 8627A (type, in Herb. Kew.)

var. **nudum** C. E. C. Fischer var. nov.; omnibus partibus minoribus, appendice graciliore apice subacuta processibus destituta distinctum.

Smaller in all parts. *Cataphylls* 2, papery, narrowed to an obtuse apex, inner up to 6 cm. long, olive-brown with scattered whitish marks. *Leaves* 2, pedately 5-foliolate or sometimes 3-foliolate; petioles 8–16 cm. long, coloured like the cataphylls; leaflets elliptic to oblanceolate, acute and cuspidate, base acute, median 7–11 cm. long, 2.2–3 cm. wide, with a petiolule 6–11 mm. long, primary nerves 6–8, margin slightly revolute, lateral smaller, in the 3-foliolate leaf sessile or subsessile. *Peduncle* 7–12 cm. long. *Spathe-tube* 3.5–4.5 cm. long, limb 3–4 cm. long, 2 cm. wide. *Appendix* more slender with a subacute apex devoid of processes. *Berries* scarlet.

In the same locality as the type, fls. and frt. Sept., *F. Kingdon Ward* 8627B (type, in Herb. Kew).

var. **viride** C. E. C. Fischer var. nov.; simile var. *nudo*, sed spatha pallide viridi immaculata.

Cataphylls up to 14 cm. long, subacute, not spotted. *Leaves* 2, 3-foliolate or pedately 5-foliolate; petioles up to 21 cm. long, not spotted; leaflets obovate or oblanceolate, cuspidate, the median 8.5–10.5 cm. long, 3.8–5 cm. wide, lateral smaller and narrower, sessile in 3-foliolate leaves, veins whitish on a glossy dark-green ground, paler below. *Peduncles* up to 15 cm. long. *Spathe* pale-green, unspotted; tube 4–5 cm. long; limb oblong-lanceolate, acuminate, 4–4.5 cm. long with a filiform tail 1–2.5 cm. long. *Appendix* as in var. *nudum*.

In the same locality as the type, under bamboos on the ridge, fls. Sept., *F. Kingdon Ward* 8556 (type, in Herb. Kew.).

Arisaema speciosum Mart. var. **truncatum** C. E. C. Fischer var. nov. [Araceae]; a typo spadice supra flores abrupte truncata incrassata differt.

“♂ *spathe* with a very wide (14 cm.) inflated hood bent over and completely protecting the entrance, white-striped on a chocolate ground.” ♂ *inflorescence* 3.4 cm. long; pollen white. *Appendix* truncate and then slightly tapering and curved for 9 cm., then again swollen and strongly recurved for 3 cm. and finally rapidly tapering into a filamentous flagellum 2–3 ft. long.

Delei Valley, 28° 22' N., 96° 37' E, in temperate rain-forest, 6000–7000 ft., fls. May, *F. Kingdon Ward* 8193 (type, in Herb. Kew.); same locality, “Leaf standing 4 ft. high, with a span of 3 ft.”, *F. Kingdon Ward* 8461.

Arisaema Wattii Hook. f. [Araceae].

Manipur and Naga Hills.

Delei Valley, 28° 21' N., 96° 37' E., common; scattered on steep slopes in temperate rain-forest, 7000–8000 ft., fls. April, *F. Kingdon Ward* 8243. “*Spathe* variously striped and mottled more or less

chocolate on a greenish ground." Leaves sometimes 5-foliate, and then the 2 outer leaflets narrower with the 2 sides not quite so dissimilar as in the 3-foliate specimens.

XXXI—MISCELLANEOUS NOTES.

DR. HUTCHINSON.—Dr. J. Hutchinson has been elected a Correspondent of the Academy of Natural Sciences of Philadelphia.

LORD WAKEHURST.—We record with deep regret the death, on April 30th, of Lord Wakehurst, LL.D., V.M.H., who, as Mr. Gerald Loder, was President of the Royal Horticultural Society from 1929 to 1931.

Lord Wakehurst was a genuine lover of plants, but his interests centred more especially in trees and shrubs, and so far as woody plants are concerned Wakehurst Place, near Ardingly, can assuredly be placed amongst the half-dozen most important gardens in the British Isles.

His collection was as remarkable for its extent as it was for its excellent cultivation and the beauty of its setting. He kept so well abreast of the times that scarcely a new species of any garden value escaped his notice. Favoured with the genial Sussex climate and a good soil he was able sooner than most cultivators to show new introductions at their best.

Wakehurst Place is one of the most famous Elizabethan houses in England and its sylvan setting is appropriately beautiful. The varied surface and contours of the surroundings afford many charming features, one of the most attractive of which is a glade, almost a ravine, extending from near the house to a piece of water.

On its sides are grown many of the larger-leaved rhododendrons recently introduced from China, N. Burma and Tibet. Lord Wakehurst was particularly interested in this genus and in 1921 he presented the Loder Rhododendron Cup to the Royal Horticultural Society.

He had the true collector's spirit as was shown by a remarkable but somewhat motley assembly of shrubs grown in pots which he found room for in cool greenhouses and frames. Of New Zealand and other Australasian shrubs he had a very notable collection and he presented a cup to be awarded annually in New Zealand for the best collection of native plants.

In addition to his Presidency of the Royal Horticultural Society, Lord Wakehurst was also President of the Royal Arboricultural Society, 1926-27. He took a deep interest in conifers and played a leading part in the success of the 1931 Conifer Conference. Apart from horticulture, Lord Wakehurst, as Chairman of the Southern Railway, and as Member of Parliament for Brighton from 1889 to 1905, took a prominent part in public affairs. An indication of the multiplicity of his interest, well-known to his friends, was a large bundle of letters, memoranda, press-cuttings and such-like, held

together with an elastic band, which, to the dismay of his tailor, he habitually carried about with him in his pocket !

Like most really great gardeners, Lord Wakehurst was a free dispenser of his surplus plants. Kew has many times benefitted from his gifts, especially at the time of the establishment of the National Pinetum at Bedgebury. Indeed, generosity and kindness in all things to all men, were his outstanding characteristics.

W. J. BEAN.

LEONARD RODWAY.—We record with regret the death of Mr. Leonard Rodway, C.M.G., late Honorary Government Botanist, Tasmania, on March 9th 1936, after a long illness, at his home Melaleuka, Kingston, Tasmania.

Mr. L. Rodway was born at Torquay, England, in 1854 and after leaving school joined the naval training ship Worcester. From there he transferred to the merchant service but was forced by illness to relinquish this career. He went to live in Queensland and afterwards moved to Tasmania in 1880, where he practised as a dental surgeon. His interest in botany led him to join the Royal Society of Tasmania four years later. He carried on his botanical work in his spare time, sending his plants at first to Baron von Mueller at Melbourne for determination and later, after Mueller's death, working them out himself. During this period he gained an increasing knowledge of the plants of Tasmania which culminated in the publication of "The Tasmanian Flora" in 1903. Mr. Rodway also produced a popular handbook of the wild flowers of Tasmania. His botanical tastes were catholic, embracing cryptogams as well as phanerogams. In 1914 he published a volume dealing with the mosses of Tasmania ; this was to be followed by one on the hepatics, but for some reason this latter never materialised. In addition to these major works he was a regular contributor to the local scientific periodicals. Mr. Rodway held the post of Honorary Government Botanist for over 30 years and took a prominent part in most of the botanical activities of the country. To him, Tasmania owes almost entirely its Herbarium, which he had built up by his own unaided and devoted efforts during the many years he served without any salary as Government Botanist. The Herbarium, though consisting mainly of single specimens of each species, is very well preserved and all the specimens are well mounted, unlike most of those in other Australian Herbaria. In 1924 Mr. Rodway was awarded a medal by the Royal Society of Tasmania in recognition of his valuable work on the flora of the country. He retired from his official posts in 1932 as a result of failing health. His death is a sad loss to botanical science in Tasmania.

JOSEPH CLEMENS.—We regret to learn of the death, at the age of 73, of Chaplain Joseph Clemens from food poisoning in New Guinea on the 21st January, 1936. Formerly a Methodist Chaplain attached to the Army of the United States of America,

Mr. Clemens, after retirement and accompanied and assisted by his devoted wife, spent several years in arduous botanical collection in Cochín China, Borneo, the Philippine Islands and latterly in New Guinea. It was during an interval in plant hunting and when on the way to attend a conference at the German Lutheran Mission at Finschafen in New Guinea that Clemens contracted the disease to which he succumbed.

At an age when most people seek a well-earned rest this remarkable pair of enthusiastic plant collectors cheerfully faced exposure and hardship under conditions of considerable discomfort. They spent months on end in remote localities where little or no previous botanical research had been attempted so that their extensive gatherings have great scientific value. Sets of their collections from Borneo, including Mount Kinabalu, and from Indo-China, comprising over 8500 numbers, were acquired for the Herbarium.

Regeneration of Vegetation in Arid South Australia.—Few ecologists with a wide experience will deny that man is the most important acting agent in modifying vegetation. Apart from his introduction of crop plants, this activity has been destructive rather than constructive. It is becoming more and more realized that in many parts of the world the destruction of the natural climax communities results, often speedily, in further changes which cumulatively have great, sometimes drastic and nearly always harmful, effects on human economics. To discover how far such effects can be prevented, or how they can be remedied where they have occurred, is one of the chief problems of applied ecology.

In areas where the climatic or edaphic factors are of an extreme type and where, therefore, plant-life is on the border-line of existence, the effects of man's interference, especially through the introduction of flocks, herds, and pests, are often particularly obvious. Such an area is the arid region of South Australia, and a recently published ecological study* of a restricted part of the North-East District is worthy of wide notice. The Koonamore Vegetation Reserve, an area of some 1,260 acres, was enclosed by rabbit- and sheep-proof fencing in July 1925. The Reserve is situated on an elevated peneplain surrounded by low hills of Pre-Cambrian strata from which the soils have been derived by erosion, flood deposition, and wind. The four main soil groups are those of the sandhills, sand-plains, silty flats, and shrub steppes. The average annual rainfall in the area is low (8·12 inches) and approximately only one-third of it is effective, the rest falling in such quantities as not to penetrate the soil. Both droughts and heavy storms are not infrequent and the latter often cause considerable erosion. Humidity shows great fluctuations but through every month, including the hot summer

*T. G. B. Osborn and T. B. Paltridge: On the climate and vegetation of the Koonamore Vegetation Reserve to 1931, in *Proc. Linn. Soc. N. S. Wales* 60, 392 (1935)

months, the air becomes almost saturated with water-vapour for a part of the day, a fact which, it is believed, accounts for the success of the saltbush through the district.

The area chosen for the Reserve at Koonamore was deliberately picked as being "the worst eaten-out portion of the paddock." The effect of heavy sheep-grazing upon the indigenous flora has led at times to complete extinction of the shrub-steppe community.

Permanent quadrats (100 m., 10 m., & 1 m. to a side) were charted and photographed at regular intervals. From the data already recorded it has been found that the principal factors affecting regeneration of the flora on the Reserve are erosion, due to removal of the perennial vegetation, temperature extremes, strong winds, low rainfall, heavy rainfall, and rabbits. Erosion has destroyed the seed-bed over a large part of the area, and the hard loamy soil, having lost its surface mulch, makes establishment of seedlings difficult. Accumulation of litter, fallen bushes, and blown soil all favour seedling establishment. It is somewhat surprising to learn that in this arid part of Australia there occur frosts and heavy rainfalls (3 inches or more in 24 hours) which not infrequently occasion considerable damage to the vegetation. The most aggressively harmful factor to the regeneration of woody plants has certainly been the rabbit. In one enclosure, a single rabbit in one night destroyed 18 one-year-old mulgas (*Acacia aneura*). As the authors conclude, "until some means of controlling the rabbit is discovered, all hope of regeneration of woody perennials is vain."

It is greatly to be hoped that the research so ably commenced at Koonamore will be continued by the same intensive methods of study as those which have already yielded such interesting and important results. Ecology is, and must long remain, an inductive science, and only intensive investigations combining the methods of comparative observation and experiment, and continued year after year, can lead to sound generalizations and give a basis for the treatment of practical problems.

W. B. TURRILL.

Gentians.*—Though much has been written in recent years on the more popular gentian species and hybrids, little information has been available to the gardening public on the rarer and more recently introduced species. A comprehensive book on the genus was therefore much needed.

It is for the gardener, amateur and professional alike, that this book is written and it is noteworthy for the welcome absence of padding and "fine language," and for the skill by which technical terms, puzzling to non-botanists, are avoided. The arrangement of species is alphabetical and it would have been useful if the section

* By David Wilkie, Assistant Curator, Royal Botanic Gardens, Edinburgh. Illustrated from photographs, with a frontispiece by John Nash. Published by Country Life Ltd., London, Charles Scribner's Sons, New York, 1936. Pp. xii + 187. Price 12s. 6d.

to which each belongs had been given. Though the author states that it will not appeal to those only botanically interested in the genus, the descriptions are carefully drawn up and references given not only to the original description but also, wherever possible, to a figure of the plant. There are no keys for identification but in many cases a species rare in cultivation is contrasted with another allied and better-known species. The generic concept accepted is very wide, including not only all the sections of *Eugentiana* but of *Gentianella* as well. The accuracy of the botanical matter is on the whole praiseworthy, which should help materially to reduce the existing confusion in garden and nursery names. As an example one might quote the plant which has been grown as *Gentiana Purdomi* (and under other names) for years and is here determined as *G. gracilipes* Turrill.

The notes on the culture of each individual species are based on practical experience and will be of immense value to those who are attempting to establish species not previously grown. Propagation is dealt with separately: division and seed-raising have, of course, been the usual means of increasing stock, but the fact that cuttings of the rarer species can be struck will come as news to many and will open up new vistas to those who take a keen interest in raising their own plants.

Hybrids and hybridising are discussed in a practical manner and mention is made of the confusion resulting from indiscriminate crossing. This practice might have been more vigorously condemned, as determination of garden material in certain sections is already difficult and, in the course of a few years, is likely to be almost impossible.

The value of the book is greatly enhanced by the many excellent photographs reproduced. They are principally of living plants but a few are of original drawings and herbarium specimens: of the former, several are of plants growing in their native habitats photographed by the late George Forrest and other collectors. Some of the pictures, however, do not do the plants justice; this remark certainly applies to the coloured frontispiece of *Gentiana sino-ornata*.

In the list of "species not described in full," which contains nearly 700 names, together with notes on habit, colour and distribution, the great geographical range of the genus is strikingly emphasised.

This is a sound practical book and a welcome addition to the series which has been published in recent years dealing with individual genera.

Welsh Timber Trees.*—The need for a second edition of this very useful and instructive work on trees has enabled the author to amplify the information given on most of the subjects

* By H. A. Hyde, M.A., F.L.S. Published by the National Museum of Wales and by the Press Board of the University of Wales, 1935. Pp. 107, illustrations 49. Price 2s.

dealt with in the first edition in 1931, particularly in the citation of well-grown specimens and on timber utilisation. As in the first edition, he gives clear and concise descriptions of the native and better-known exotic trees growing in Wales, with illustrations of the habit, leafy shoots, flowers and seeds of many species. In all cases the descriptions are singularly free from technical terms, which makes the book particularly suitable for people who have little botanical knowledge, and for use as a teaching text-book not only in Wales but throughout the British Isles. The information given is accurate and to the point, and, moreover, the author has in most cases been careful to use the names that are correct according to the International Rules of Botanical Nomenclature; to save confusion he has included as synonyms well-known names that have had to give place to others that are less well known. In one or two instances he has not taken later homonyms into account, and has, for example, kept up *Larix Kaempferi* instead of *L. leptolepis*; but these are small matters in a book of such general excellence.

W. DALLIMORE.

Raspberries and Kindred Fruits.*—This publication deals with the history of the cultivated raspberry and includes lists and descriptions of the varieties usually cultivated in our gardens, full cultural details being given of the ordinary and perpetual fruiting varieties. The loganberry and the so-called hybrid berries are dealt with in the same way. Under each section the insect pests and diseases are adequately dealt with and the standard methods of control given. Why the Japanese wine berry, *Rubus phoenicolasius*, and the strawberry-raspberry, *Rubus illecebrosus*, should be included in the chapter dealing with hybrid berries is not apparent; both are good and distinct species, the former an excellent but neglected fruit, the latter only of ornamental value.

This book is produced in an attractive manner and should prove useful to the private and amateur gardener.

Cherries and Soft Fruits.†—This valuable publication includes all the papers read at the Fruit Conference held by the Royal Horticultural Society at the Greycoat Street Hall on July 16th and 17th, 1935.

From the following list it will be seen that the papers were all given by recognised experts and cover the entire field of hardy soft fruits as cultivated in Great Britain, including manuring, and the control of insect pests and fungoid diseases: — Cherries for Market-Growing Purposes (L. Doubleday), Cherries and their Varieties

* "Raspberries and Kindred Fruits; How to obtain fresh supplies daily from June till November, with chapters on the Loganberry, Hybrid Berries and Giant blackberries". By Ernest Markham, A.H.R.H.S. Macmillan & Co., Ltd., St. Martin's Street, London, 1936. Pp. 68, illustrated. Price 6s. net.

† "Cherries and Soft Fruits: Varieties and Cultivation in 1935". Report of the Conference held by the Royal Horticultural Society, July 1935. Edited for the Royal Horticultural Society by F. J. Chittenden, F.L.S., V.M.H. Pp. 164, figs. 19. Price 6s.

(E. A. Bunyard), Growing Healthy Strawberries (R. Vinson), The Nutrition and Manuring of Soft Fruits (Dr. T. Wallace), Growing Healthy Raspberries—Control of Diseases and Pests (R. V. Harris), Soft Fruits for the Private Garden (A. N. Rawes), Blackberries, Hybrid Berries and Autumn-Fruiting Raspberries (M. B. Crane), Blackberries and Loganberries (A.B. Beakbane), Soft Fruits : Notes on Varieties Under Trial at Wisley (A. N. Rawes), Commercial Cultivation of the Gooseberry (H. Selby), Varieties and Quality of Fruits Required for Canning (W. B. Adam), and Bottling Soft Fruits at Home (Miss E. M. Gunnell). The discussions following the papers are reprinted and together form perhaps the most valuable part of the book.

At its moderate price, this publication is excellent value and should be on the bookshelf of every commercial and private grower as a handy and reliable book of reference.

American Ferns.*—Books entirely devoted to the popular study of ferns are now comparatively rare, though fifty or sixty years ago they were much in vogue. The present work, though specifically designed for American readers, contains much that is of general interest to everyone interested in ferns. The treatment of the subject is somewhat unusual. Detailed instructions are given for propagating ferns from spores, accompanied by excellent photographic illustrations. An innovation is the ecological treatment of the species considered. These are grouped into a number of "associations," such as Oak-Hickory Association, Open Field, and so on, and stress is laid on the importance, when planting, of imitating natural conditions as closely as possible. Much useful information is given on the use of ferns in rock- and water-gardens, and designs are given for special fern-gardens.

Unfortunately the nomenclature is out-of-date, being that adopted by Asa Gray in his Manual of 1908. There can be no excuse for this, since Christensen's "Index Filicum" has been the standard work on fern names for the last thirty years.

There is a short glossary of technical terms at the end of the work in which one finds "lanceolate" defined as "several times as long as broad!" There are other errors also in the book, which tend to mar what is otherwise an attractive work. The photographic illustrations, of which there are many, are excellent, while the text is written throughout with an infectious enthusiasm. May it succeed in stimulating a new interest in a much-neglected group of plants!

F. BALLARD.

*"American Ferns: How to Know, Grow and Use Them." By Edith A. Roberts and Julia R. Lawrence. The Macmillan Co., New York, 1935. Pp. viii+98, 52 illustrations. Price 10s. 6d. net.

Printed under the authority of HIS MAJESTY'S STATIONERY OFFICE
By the South Essex Recorders, Ltd., High Road, Ilford.

(847) Wt 15/33. Ps. 381. 825. 7/36. S.E.R. Ltd. Gp. 381.

S.O. Code No. 70-51-1-35